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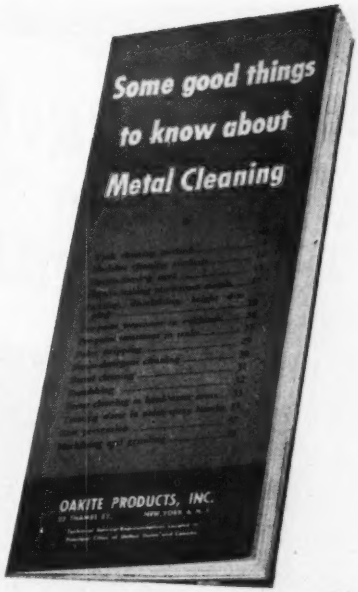

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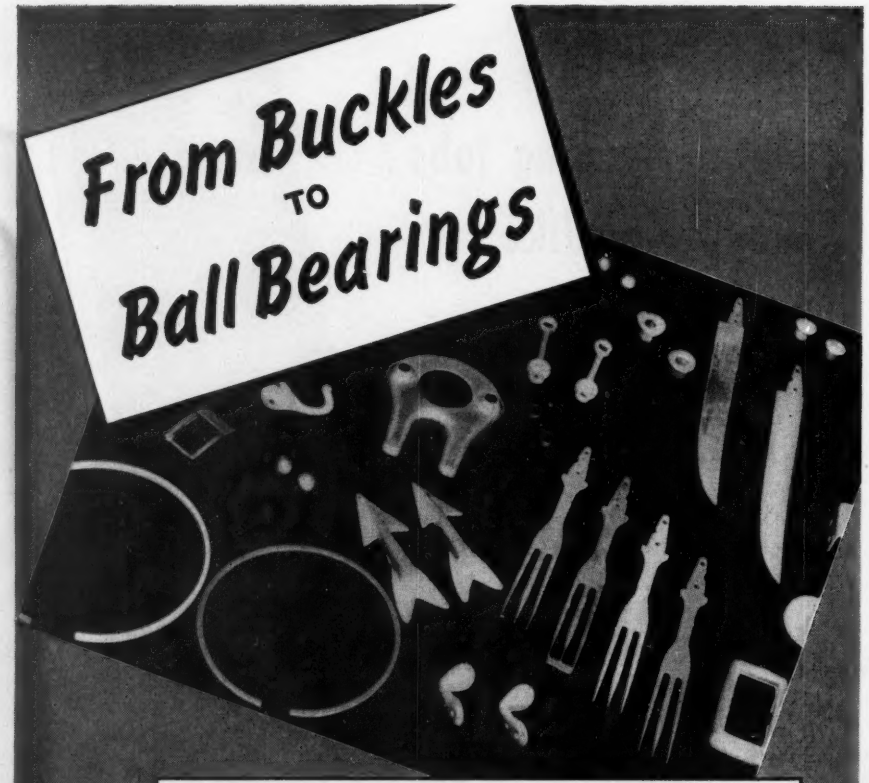

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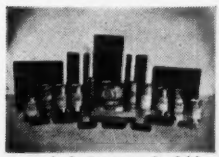

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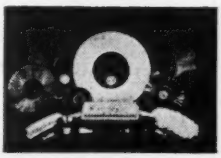

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EZRA A. BLOUNT, *Editor*

Products finishing

MARCH 1951

VOLUME 15 • NUMBER 6

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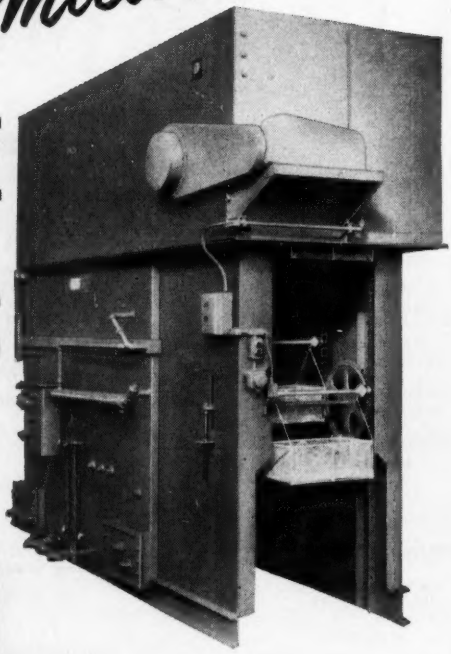

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editorial

Vol. 15, No. 6

MARCH, 1951

The Challenge of New Materials and Finishes

There is in all of us a certain inherent resistance to change; a reluctance to be jarred out of our normal ways of living as well as our normal methods of manufacturing and finishing the products of American Industry. Now, with our government stockpiling strategic materials, and by reason of a greatly-increased diversion of metals into defense work, orders limiting or restricting the use of many metals normally used for electroplating have forced finishers to consider "alternate" or "substitute" finishes.

While such a course is distasteful to most finishers, it may result in the development of new materials and finishing processes which may, in the long run, prove superior to what are now regarded as standard methods.

Indicative of the developments to be expected is an announcement by J. L. McMurphy, manager of the Chemicals Division of General Electric's Chemical Department, that a new G.E. product, called R-108, may be used as a replacement for tin and certain alloy metals in chemical processing equipment, metal drums, and food containers.

Since so many of the common metals are no longer available for the civilian economy in the quantities desired, science and industry now have an increased interest in the less common metals. Battelle Memorial Institute, an industrial and scientific research organization, has created a new assistant directorship and assigned a special staff of scientists to explore the metallurgy and chemistry of metals in up-to-now unexplored fields.

These examples show how American ingenuity and resourcefulness react to problems such as those which face us today.

While at the moment shortages of materials we normally use may annoy us, the present emergency may force us to devise finishing materials and processes which will enable us to "get the job done" as usual, and in a more efficient, more economical manner.

Ezra A. Blount

Finishing Floor Registers and Grilles

In planning the expansion of production facilities in a newly acquired plant, Auer Register Company plant engineers worked closely with finishing equipment engineers and industrial finish engineers. The result is a finishing system of maximum efficiency, in which both the synthetic enamel finish and the cleaning, spraying, and baking equipment were literally designed to work together in producing a coating of specified high quality.

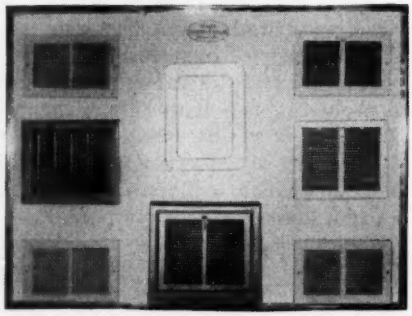
By EZRA A. BLOUNT
Editor

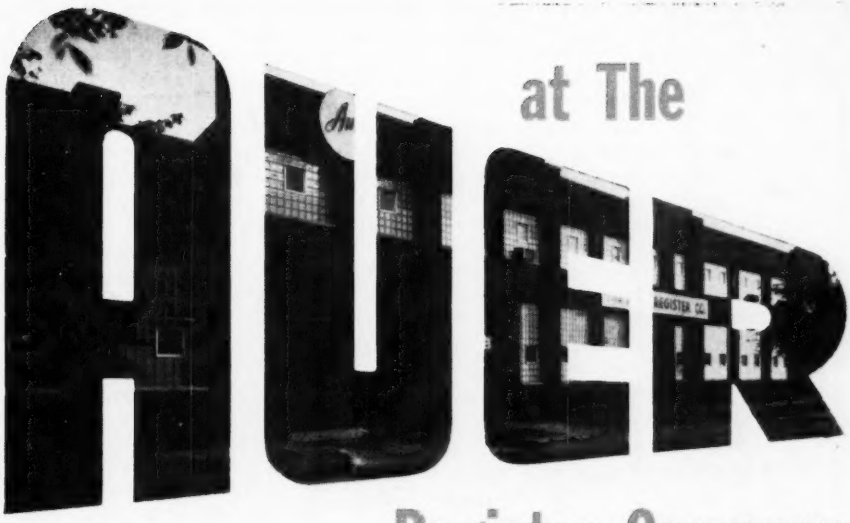
THE Auer Register Company, Cleveland, Ohio, founded in 1907 by the late George S. Auer, manufactures registers and grilles of many types and sizes for heating, ventilating, and air conditioning equipment. Figure 1 shows a few typical examples of the grilles and registers manufactured by the company. These products are fabricated from steel, Monel metal, aluminum, bronze, or stainless steel, and are supplied in a wide variety of attractive surface finishes.

The company recently moved to a larger plant, and capitalized upon this opportunity to streamline production facilities and engineer the entire process flow so that products of improved quality could be manufactured more efficiently. At the present time 6,000 units can be completed each nine-hour day. The company employs 160 persons, part of whom work on a second shift.

In the attractive monitor-type one-story Auer plant, air conditioned offices and the engineering department, occupying 13,000 square feet of floor space, are located on an enclosed mezzanine across the front of the building. The 41,000 square foot manufacturing area, as can be seen from Fig. 2, is rectangular in shape, and has been planned so that material flows logically and smoothly from one front corner of the plant (receiving area) through the plant (the flow path gen-

Fig. 1—A few examples of the many types and sizes of heating and air conditioning registers and grilles manufactured by The Auer Register Company.
(PRODUCTS FINISHING Staff Photo)





erally follows the shape of a U) and to the packing and shipping area located in the other front corner of the building. Receiving docks and loading facilities for truck shipments are designed to simplify both operations.

Finish and Finishing System Design

After Auer engineers, working in cooperation with finishing equipment suppliers, had assigned the proper proportion of plant floor area to the finishing department, the individual items of finishing equipment were designed and installed. These included a three-stage vapor degreaser, an electrostatic spray booth, a water-washed spray booth for hand spraying, a grainer, and a gas-fired oven all joined together by a two-unit transport conveyor system to convey the products through the entire finishing cycle. The considerations influencing the finishing department design are interesting.

Prior to the installation of the present finishing department, some Auer register finishes were hand dipped; others were hand sprayed before baking at various times and temperatures in batch ovens. Some concept of the type and number of standard finishes used may be gained from the following list:

Medium Oak—Medium Oak Ground Coat and Medium Oak Color Varnish
Buff Oak—Buff Oak Ground Coat and Medium Oak Color Varnish
Duralustre—Tan Metallic Enamel
Hammertone—Brown One Coat Hammer Finish
Duratone—Brown Primer Finish
Black—Black Enamel for Faces of Registers
Box Finish—Black Enamel for Register Boxes
White—One Coat White Enamel
Ivory—One Coat Ivory Enamel
Green—Green Enamel
Artoxide—One Coat Semi-Gloss Black Enamel, baked and shaded with copper bronze in lacquer vehicle

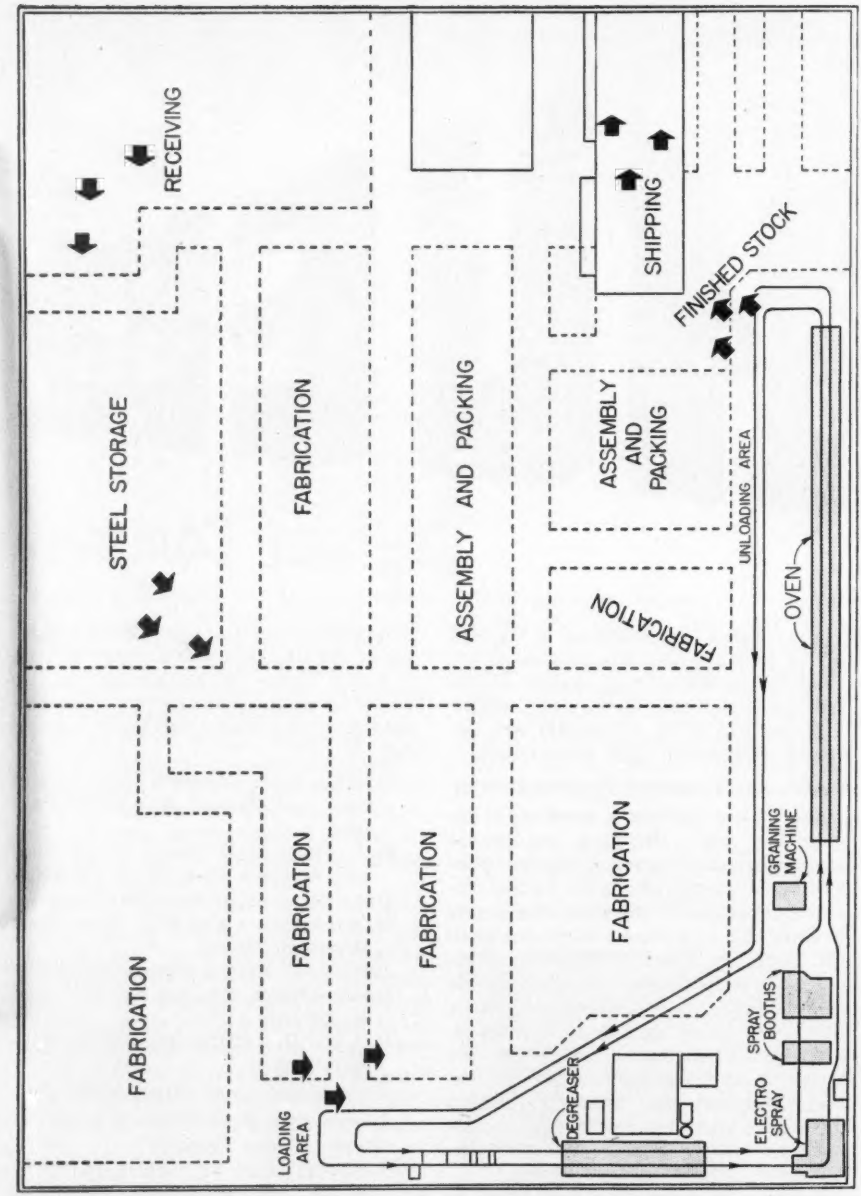


Fig. 2—Floor plan of the Auer plant showing general flow of material as well as finishing department equipment layout.
(Illustration courtesy The Auer Register Co., Cleveland, Ohio)

To accomplish finish standardization, the industrial finishing engineer associated with the paint supplier formulated the various finishes so that all could be baked at 350 deg. F. for 11 minutes. Further, in the interest of simplicity, one solvent—xylol—was selected as the reducer to be used in all finishes, and this constituted an additional consideration for the finish formulator.

It was also necessary that all materials, with the exception of the color varnish, which is applied by a roller, be adapted to either hand spray or electrostatic spray.

Each finish was formulated to have excellent adhesion, high abrasion resistance, low film thickness with complete opacity, and prolonged life and color retention under a 350 degree heat. In one of the finishes it was necessary that baked parts withstand intermittent heat of 400 deg. F. for a long period without color change. These requirements are important because many of the finishes are used on floor registers as well as wall registers, and on hot air registers as well as cold air returns.

The quality and durability (hardness and toughness) demanded by Auer Register Company would not permit the use of low heat curing finishes. It was necessary that 350 deg. F. be employed as the curing temperature for all materials used.

With the exception of the Buff and Medium Oak systems all finishes are applied with one coat over clean bare metal. These two systems may be of interest as outstanding finishes.

The register people still demand a grained finish in some colors. For years this was accomplished as follows:

> One spray ground coat, ½-hour bake at 300 deg. F., roller coat of graining ink, bake 15 minutes

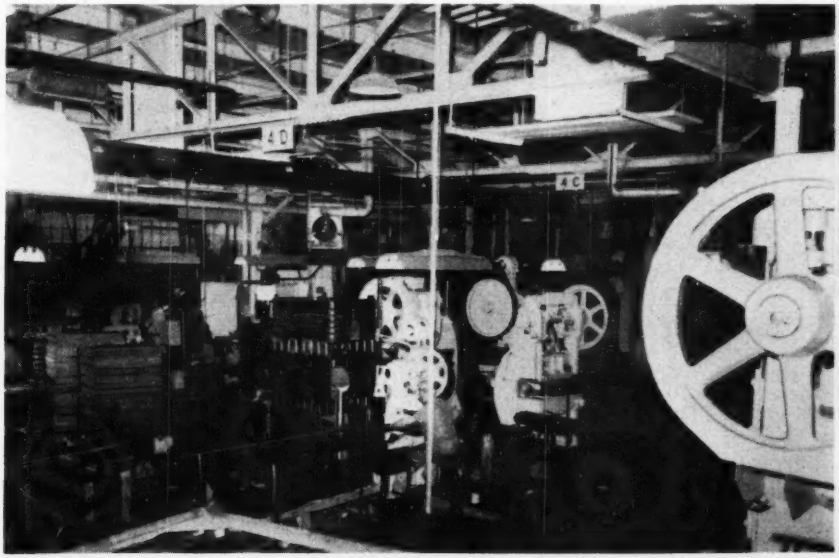


Fig. 3—A view in the fabrication section showing how the 20-foot plant ceiling provides ample space for machines and all necessary overhead equipment.
(PRODUCTS FINISHING Staff Photo)

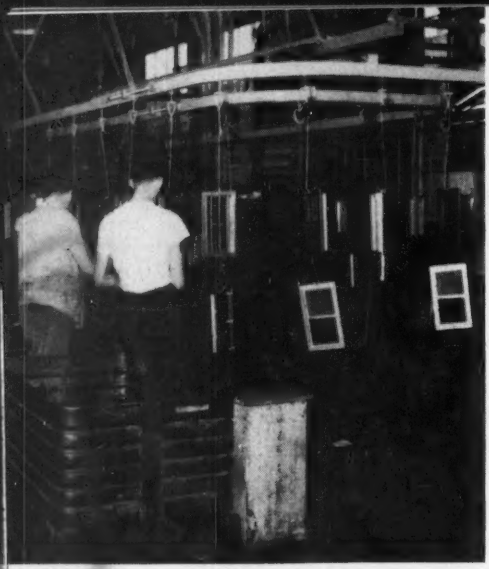


Fig. 4—Registers are removed from shop trucks or pallets and hung on the Richards-Wilcox two-unit conveyor at this station. (*PRODUCTS FINISHING Staff Photo*)

at 250 deg. F., spray coat of gloss baking varnish, bake ½ hour at 250 deg. Fahrenheit.

The present system consists of one spray coat of Benton-Climo Semi-Gloss Ground Coat, bake for 11 minutes at 350 deg. F., and finish with a roller coat of Benton-Climo's Medium Oak Color Varnish that is baked for 11 minutes at 350 deg. F. In this finish the first bake on ground coat must be tough enough to stand handling and roller coating. It must be soft enough to allow the color varnish to bind, and the finish has to be tough and adhesive after the second bake. This special Benton-Climo finish has better abrasion resistance than the old three-coat finish and it does not become brittle with age.

To fulfill the requirements of the baking cycle in a conveyorized oven, it was essential that the metal temperature of all portions of the painted grilles or registers remain constant without fluctuation at peak heat. Further, some sprayed parts enter the oven exactly four minutes after being sprayed. Such parts must be brought up to 350 deg. F. in the oven at an even rate of temperature rise. If any hot spots were present in the oven, finishes such as Hammertone and Duralustre would pin hole and blister when subjected to a high heat blast before the solvents had a chance to leave the film.

The Finishing Process

While there is some variation in the normal manufacturing process or production flow due to differences in design and complexity of products, the normal order of manufacturing operations is as follows:

1. Shear.
2. Form.
3. Assembly spot weld.
4. Apply finish.
5. Pack and ship.

Most Auer registers are made of 12, 16, 18, or 20 gauge steel. This material (either cold rolled or hot rolled, pickled) is received oiled and wrapped, either in sheets or coils. Sheet stock is sheared, blanked, or blanked and pierced, formed, and assembled. Conventional presses are employed for these operations. Coil stock is fed into automatic-feed punch presses for the blanking and slotting operation. In some cases a press-assembly operation is employed, after which corner plates are spot or projection welded. Figure 3 is a view of one section of the fabrication area.

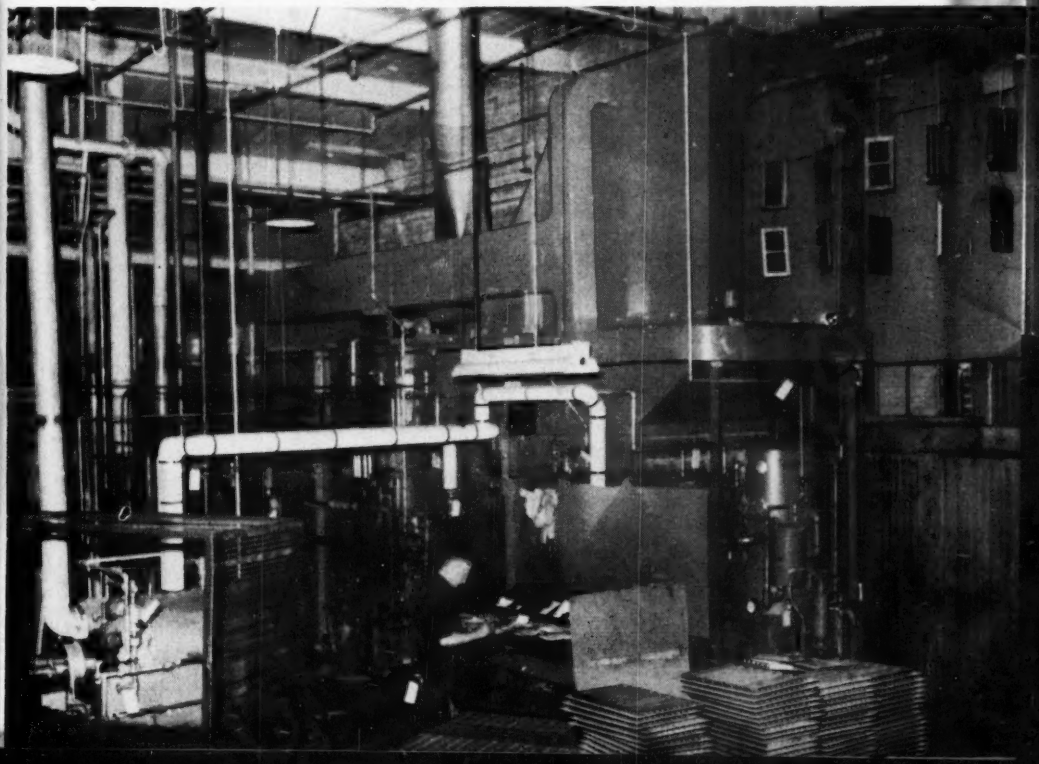
Material handling is accomplished through the use of pallets, metal or wood shop boxes, and conveyors. Fork trucks shift boxes of parts rapidly from one operation to the next.

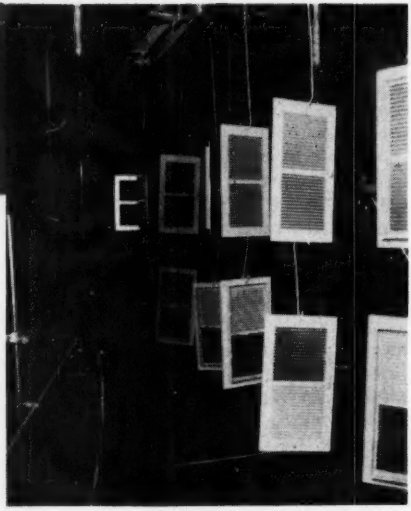
When registers reach the finishing department, they are hung on the Richards-Wilcox two-unit "Zig-Zag" conveyor, on 18-inch centers (see Fig. 4), and transported at the rate of 9 ft./min. through the entire finishing process to the packing and shipping department. Each conveyor is power-

ed by a separate drive, and, as can be noted by reference to Fig. 2, one unit of the system routes parts through the degreaser, electrostatic spray booth, and oven; the other unit follows generally a parallel path, but travels through two hand spray booths instead of the electrostatic booth. The total length of the combined conveyor system is 1200 feet.

At the conveyor loading station shown in Fig. 4, operators hang those registers to be sprayed electrostatically on one conveyor and those to be hand sprayed on the other conveyor line. Then, both lines travel up an incline so as to enter the vapor degreaser from a point above the machine. Figure 5 shows the two-unit conveyor transporting registers into the Detrex degreaser. This 30-foot long, 6-foot wide unit, heated by steam from a special cyclo-therm boiler shown at the left in Fig. 5, is designated as the Model VM-325-2S Special. It consists of three cleaning stages: a spray section in the center, flanked by vapor sections on each end. Most of the oil and grease is removed from parts entering the degreaser in the first vapor stage. The relatively thin metal registers heat up quickly to the temperature of the degreasing solvent vapor, so that condensation of the vapor on the metal product surface stops. The liquid solvent spray section—the second step in the degreasing cycle—performs both the function of cooling the parts slightly and cleaning them further by pressure washing with solvent at 150 deg. F. The slightly cooled registers now pass into the final vapor section of the degreaser in which cleaning is completed. Degreased registers dry quick-

Fig. 5—Photo shows registers entering Detrex three-stage degreaser to be cleaned prior to painting.
(PRODUCTS FINISHING Staff Photo)





ly as they travel up and out of the exit bonnet of the degreaser.

One transport conveyor transports degreased registers directly to an 8-foot wide by 12-foot deep electrostatic spray booth. As the parts travel through this booth between grids, located at a minimum distance of 12 inches from the outside of the parts being sprayed, and charged with 130,000 volts (see Fig. 6), they are made to rotate by the movement of the special circular conveyor hook against a metal bar. The work is grounded through the workholder, rotator, and the conveyor. Either a 1, 2, or 4-gun spray setup can be used in the electrostatic spray booth. The paint viscosity depends on the type of finish being sprayed, varying generally from 14 to 19 seconds in a Zahn viscosimeter. The finish is sprayed at a fluid pressure of 3 p.s.i. and at 15 p.s.i air pressure. The automatic Ransburg process provides complete coverage and considerably greater mileage than that obtained by hand spray, with overspray losses being correspondingly reduced. A 24-inch exhaust fan removes any objectionable vapors present.

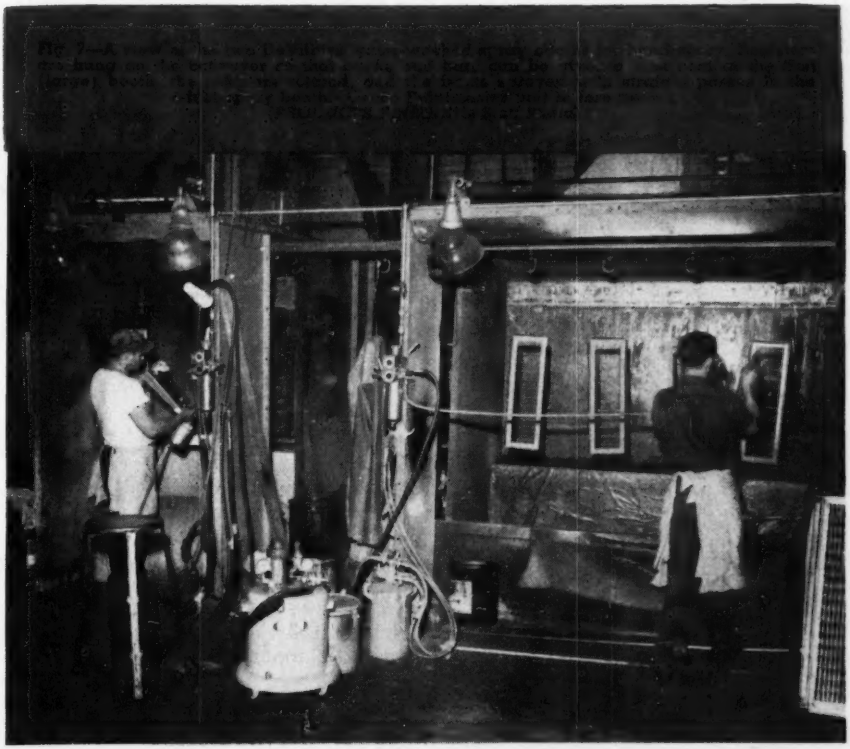
Registers and grilles which do not lend themselves to electrostatic spray finishing are routed through two water-washed hand spray booths on the other conveyor unit. In these spray booths (see Fig. 7), an 8-foot booth and a 4-foot booth, the specified finishes are applied with conventional spray equipment. A Graco paint circulating unit, operated by air, continually mixes and circulates paint from the container to the spray gun. Advantages of the unit include the fact that it can be set directly on a 5-gallon paint can, and opened easily from time to time so that the operator can make any necessary additions of reducer or finish. Using the Graco unit, paint is sprayed at a fluid pressure of 8 p.s.i. and at 40 p.s.i. atomizing air pressure. Although the specified spraying pressures hold paint overspray to a minimum, a 36-inch exhaust fan and duct on the 8-foot booth and a 20-inch exhaust on the 4-foot booth draw undesirable paint particles through the water curtain where they are washed from the air, which is then exhausted through the plant roof.

Painted registers, sprayed by hand or electrostatically, are next baked at 350 deg. F. for 11 minutes in a Lanly A-Type Continuous Paint Baking Oven, a view of which is shown in Fig. 8. The tunnel type oven, which is 105 feet long, 6 feet wide, and 6 feet 9 inches high, insulated throughout with 4 inches of Fiberglas between inner and outer steel walls, is a recirculating gas-fired unit. The combustion chamber, equipped with an Eclipse atmospheric burner actuated by a Partlow

recorder-controller, is located under the oven proper and at the center of the unit, as shown in Fig. 9, to provide improved operating efficiency and a neater exterior appearance from a design standpoint. The oven entrance and exit are located lower than the main body of the unit to eliminate or hold to a low value loss of heat by leakage through these openings.

Warmed air is circulated throughout the furnace from two New York Blower Type ME slow speed fans with double inlets, mounted on a common shaft, through circulating ducts located on each side of the oven along its entire length. Air is returned to the heating chamber for recirculation by means of ducts located along the oven floor. Adjustable duct openings provided with deflectors located on the supply ducts make possible adjustment of the warm air supply to the oven to establish a desired temperature curve. The recirculating fans have a capacity of 9,000 c.f.m., and operate continuously while the oven is in use. An oven exhaust is located on the discharge end and is adjusted to remove the proper amount of air from the oven interior according to the solvent evaporation produced by the volume of production being processed at any given time.

The heating curve on the oven was established with the aid of a Bristol traveling temperature recorder and adjusted to the desired figure. Once the heating curve was established, it has been possible to maintain tempera-



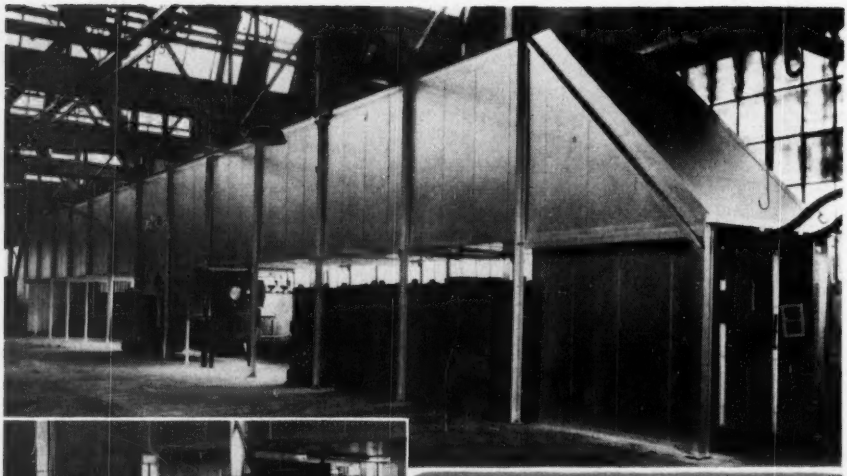


Fig. 8 (above)—Overall view of the Lanly 105-foot A-type tunnel baking oven. (Photo courtesy The Lanly Co., Cleveland 15, Ohio)

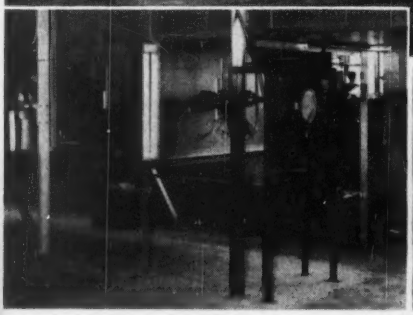


Fig. 9 (left)—A view of the combustion chamber and control panel installation on the Lanly oven. (Photo courtesy The Lanly Co., Cleveland 15, Ohio)

tures in various sections of the oven at the desired values with little or no variation. Painted registers are brought up to the finish baking temperature of 350 deg. F. gradually, and held at that temperature for 7 minutes, with only a 7 deg. F. plus or minus variation.

The oven is equipped with a Wheelco Flametrol to shut off the gas if the flame does not light or if a power failure stops the transport conveyor. Further, there is a switch on each circulating fan to shut off the gas in case the fans fail. Also, there is a high limit temperature control so that hot air entering the furnace will not exceed the desired value. In addition, a delay switch prevents the gas from being lighted until the fans have been running for 10 minutes. This safety feature provides for the removal of undesirable gas from any source from the furnace interior before burners may be lighted, and thus eliminates the possibility of an explosion. The Eclipse atmospheric gas burner used in the heating chamber burns natural gas at a 4-ounce pressure and has a capacity of 1,000,000 British Thermal Units.

Painted and baked registers and grilles leave the oven and cool for 8 minutes before being unloaded. Fans assist in the cooling if necessary. Registers which are to receive a grained finish are coated with a primer and are allowed to remain on the conveyor so that they may be unloaded at the graining machine (see Fig. 2). The products are processed through the graining machine (Grand Rapids Panel Company) and receive a coat of

graining ink. The graining machine is the direct type—with the grain design formed in the roll. After the completion of the graining operation (see Fig. 10), the registers are again hung on the conveyor just before it enters the oven, and receive another 11-minute bake, after which they are unloaded and packed for shipment. Figures 11 and 12 are views of the unloading area.

Savings Effected

A few examples of improvements in production and efficiency can be cited to dramatize the value of this conveyorized finishing installation. Before this system was installed, floor grilles were sprayed by hand at the rate of 50 per hour; now they are sprayed electrostatically at the rate of 600 per hour. Hand spray methods formerly employed frequently resulted in uneven paint films, and the paint consumption averaged 0.035 gallon per piece sprayed. By using the modern equipment and methods described above, a uniform paint film of the desired thickness is applied and the paint consumption has been cut to 0.011 gallon per piece. That these savings have been effected, not at the expense of quality, but with a concurrent improvement in product quality, should demonstrate graphically the value of a well-engineered, conveyorized finishing system.

ACKNOWLEDGEMENT

The author desires to acknowledge with thanks the assistance of the following individuals in the preparation of this article:

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The Auer Register Company
Cleveland, Ohio

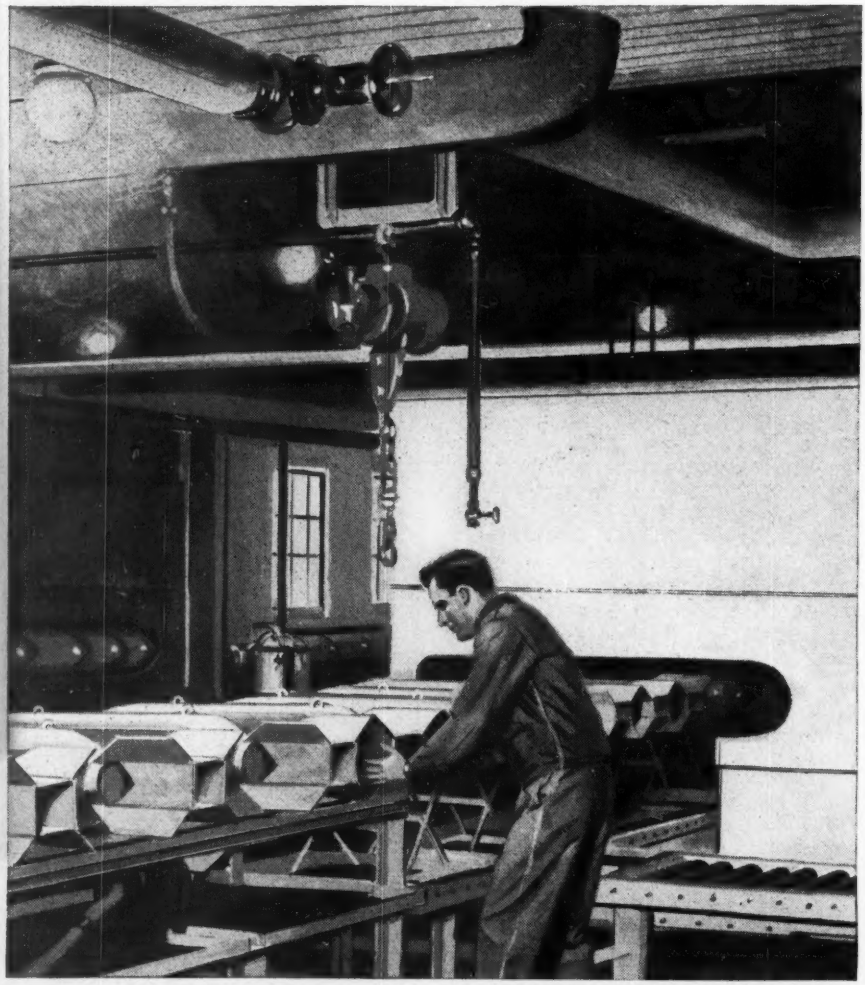
J. T. Speer
Technical Service Department
The Benton-Climo Company
Cleveland 10, Ohio

James A. Lyle
The Lamly Company
Cleveland 15, Ohio

Fig. 10 (above)—Graining machine operator in foreground removes primed and baked grilles from conveyor shown at left, processes them through the graining machine, after which operator in right background can hang them on conveyor behind him so that the final baking operation can be completed. *(PRODUCTS FINISHING Staff Photo)*

Figs. 11 and 12 (right)—Two views of the unloading station showing cooling area as well as manner in which registers are stacked prior to final packing and shipment.

Your production



Bombs on belt line being fed into booth for spraying.

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Manufacturing for the armed services—whether it's bombs or tarpaulins, tanks or communications equipment—demands specialized knowledge in the finishing of every vital component.

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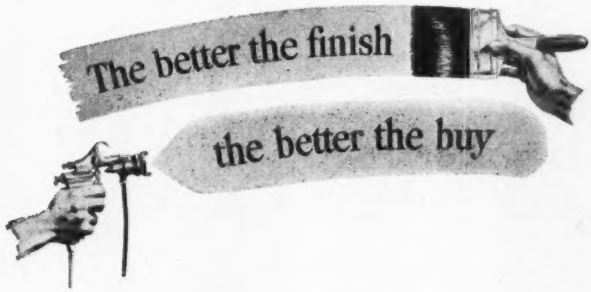


VARNISH AND LACQUER ASSOCIATION, INC., WASHINGTON, D. C.

THE ELECTRODEPOSITION

THE present national emergency has resulted in a shortage of nickel and copper for the fabrication or plating of widely divergent products. As defense orders increase, industries depending entirely upon the deposition of copper and nickel will be greatly affected. The substitution of electrodeposited iron for these critical metals, wherever possible, has been suggested from time to time. With present knowledge of iron deposition, solutions and control methods, the use of iron as a substitute in the graphic arts, record stamper and other electroforming fields is being adopted.

Although the deposition of iron dates back to about 1846, comparatively little effort has been spent on the improvement of iron plating processes. This is understandable, for although electrolytic iron is more resistant than other commercial forms of the metal, nevertheless, it is susceptible to corrosion and would not be chosen for corrosion protective or decorative coatings.

Donald Belcher[1] in 1924 reported that a German by the name of Bottger first recorded the deposition of iron in 1846. The commercial use of plated iron dates back to about 1860 where it was employed as a coating on copper printing plates. Reference is also made to electrolytic refining of the metal.

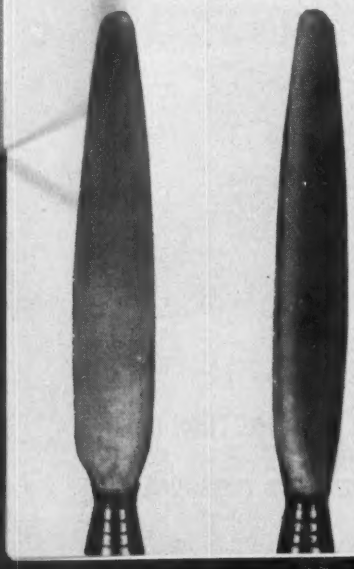


Fig. 1 — Electroplated propeller blades. The base of these blades is wood which is sealed, coated with rubber, made conductive, and plated with nickel. (*Photo courtesy U. S. Rubber Co., Norwalk, Conn.*)

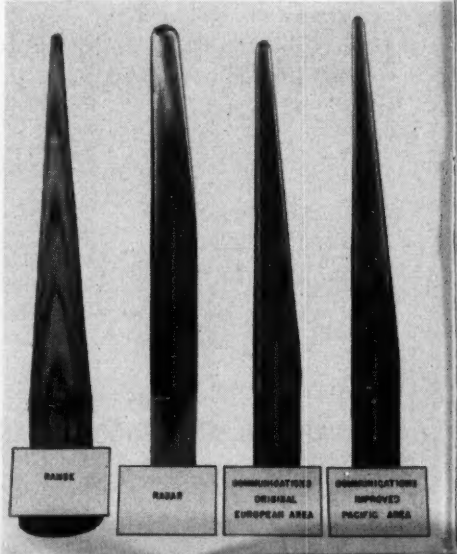


Fig. 2—Antennae masts — iron coated.

By A. D. SQUITERO
Electrochemist, Hanson-Van Winkle-Munning Company, Matawan, New Jersey

OF IRON

In 1904, Burgess and Hamburchen[2] reported the use of the ferrous ammonium sulfate bath in the electrolytic refining of iron. They also suggested its use as a steel facing on dies and electrotypes. This hard iron facing was especially suitable for the latter application because it increased the wearing qualities of printing plates.

Early work on the sulfate-chloride solution was reported in Germany in 1868. The solution was composed of:

Ferrous sulfate	4 lb.
Ammonium chloride	3 lb.
Water	30 lb.

Dr. C. F. Burgess[3] of the University of Wisconsin used a ferrous ammonium chloride solution in the refining of iron. O. P. Watts and L. H. Li[4], in 1914, worked with a solution composed of ferrous sulfate, ferrous chloride and ammonium sulfate The above authors also worked with the ferrous ammonium fluosilicate and ferrous ammonium fluoborate solutions. The deposits from these electrolytes were considered unsatisfactory.

R. M. Schaffert and B. W. Gonser[5] in 1943 worked with the sulfate-chloride electrolyte. They reported on the operating conditions, characteristics

Fig. 3—Nickel plated wooden propellers. 36-inch variable pitch and 72-inch fixed pitch wood propeller blades coated with 0.015-inch nickel deposit. Metal to wood bond strength runs 300 p.s.i. (*Photo courtesy Bone Engineering Corp., Glendale, Calif.*)

Fig. 4—Aluminum piston — iron coated.

Fig. 5—Electroformed surface roughness comparator. These blocks, used generally throughout industry, are electroformed from iron and show a perfect reproduction of 18 machined surfaces.
(Photo courtesy U. S. Rubber Co., Norwalk, Conn.)

of the bath and character of deposits. They also suggested its use in electrotyping during World War II.

Donald Belcher[6] in 1924 reported that Cowper-Coles worked with a 20 per cent solution of sulfo-cresylic acid saturated with iron. He also demonstrated the use of the hot chloride solution in the refining of iron and the production of electrolytic iron in sheet or tube form. The mixture of the sulfo-cresylic acid was never commercially successful.

W. E. Hughes[7] reported that Fisher-Langbein in 1908 began to work with the concentrated solution of a mixture of ferrous chloride and calcium chloride. The electrolyte covered in their patents is as follows:

Ferrous chloride	450 gm.
Calcium chloride	500 gm.
Water	750 cc.

Operating temperatures 194 deg. F. and 230 deg. Fahrenheit.

W. E. Hughes[8] in 1922 carefully studied this ferrous chloride-calcium chloride solution and found that the temperature was very critical. In order to employ high current densities, temperatures of 194 to 212 deg. F. had to be maintained.

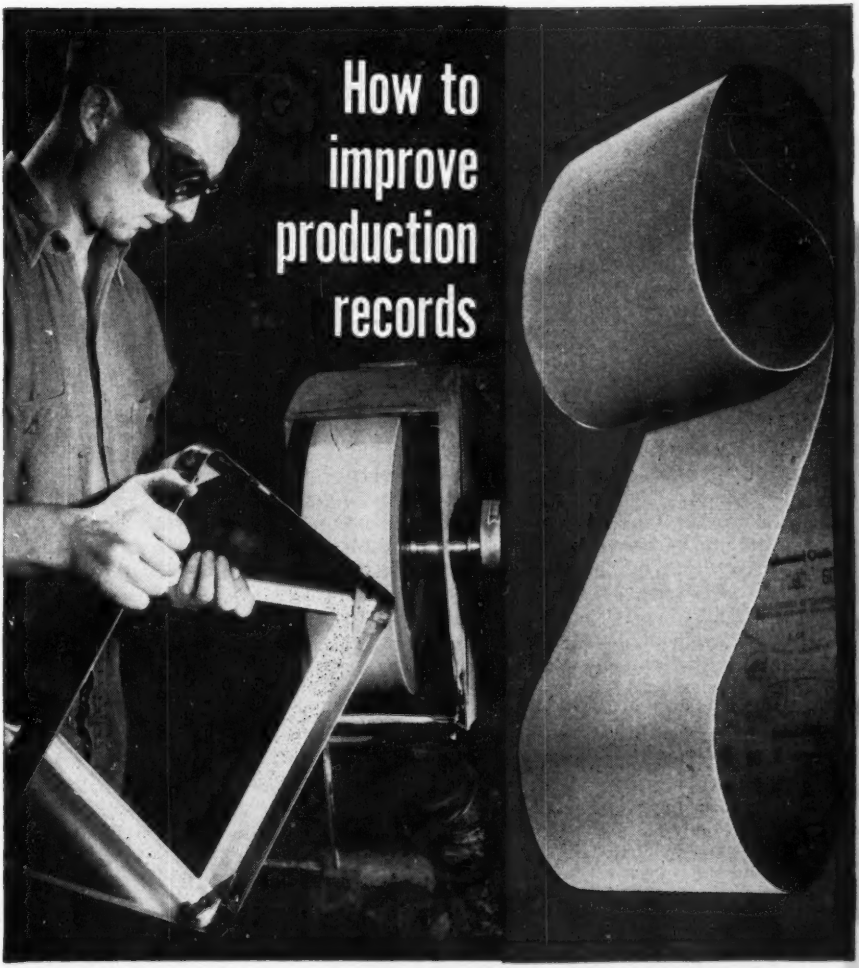
In 1930, Thomas and Blum[9] of the U. S. Bureau of Engraving and Printing, and Bureau of Standards described the use of ferrous chloride-calcium chloride plating solutions in the production of printing plates for the printing of securities. They also at that time recommended the use of the rubber-lined steel tank as a container, Armco iron anodes, diaphragms, and asbestos cloth anode bags.

Wallace and Iler[10] also worked with the ferrous chloride-calcium chloride solution. They found that by maintaining a known ferric ion concentration and a definte pH range, they were able to obtain acceptable iron deposits of constant and reproducible qualities. Operating conditions employed were:

Temperature range—
between 185 and 203 deg. F.
pH range—
between 0.8 to 1.4

They maintained the ferrous ion concentration with a pure iron anode. A secondary anode was employed to maintain the ferric ion concentration within 0.01-0.45 g./l. The secondary insoluble anode, such as carbon, was used at a potential established experimentally to maintain the desired ratio of ferrous to ferric ions.

W. B. Stoddard, Jr.[11] found that by the addition of small amounts of soluble manganese to either the ferrous sulfate or ferrous chloride solution, he was able to broaden the operating temperature and pH range and still obtain a sound and ductile deposit. He suggested a temperature range of 160 deg. F. to 220 deg. F. and a pH range of 1.2 to 2.6. The manganese also



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Composition of Iron Solutions

I. The Sulfate Solution.

	g./l.	oz./gal.
Ferrous ammonium sulfate ($FeSO_4(NH_4)_2SO_4.6H_2O$)	300	40
Ferrous sulfate, $FeSO_4.7H_2O$	202.5	57
Ammonium sulfate $(NH_4)_2SO_4$	105	14
Operating Conditions:		
Temperature	90 to 110 deg. F.	
Current density	20 to 40 amp./sq. ft.	
pH	3.2 to 5.0	
Agitation	A moving cathode rod only (Air agitation must not be used for it increases oxidation of ferrous ions).	

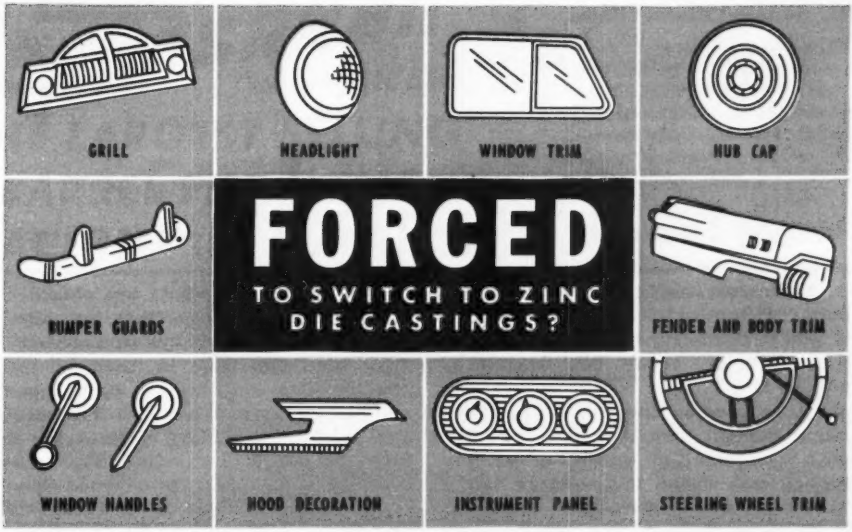
contributed to a more uniform fine-grained structure as the deposit thickness increased.

For the bath shown above commercial salts can be used. After they are thoroughly dissolved, the solution must be thoroughly reduced either by electrolysis or by the addition of pure iron filings and concentrated sulfuric acid. The solution, when reduced, will have a clear deep green color. Pure Armco iron anodes are recommended with glass cloth anode bags. As these bags have limited life, commercial tests of high temperature synthetic fabrics are now being made and it is probable that bags with longer life will be available shortly. A steel rubber-lined tank is used as a container and the heating should be done with Karbate bayonet type heaters or Karbate heat exchangers. The heating surface area required is dependent upon the volume of the solution and also the pressure of the steam available.

This solution may be used in either electrotyping or stereotyping as well as in the re-sizing of worn parts. If used on electrotypes, the pH should be around 3.2 for hard deposits. The higher pH (5.0) would produce a softer iron. The deposits produced in a bath with this formulation are relatively brittle, hard and stressed. Its use would not be recommended except where ferrous chloride solutions cannot be employed because of temperature limitations.

The following sulfate-chloride solution is more suitable for any of the above-mentioned applications:

Fig. 6 — Cast stereotypes: right, before nickel facing; left, after nickel facing. *(Photo courtesy Greater Buffalo Press, Buffalo, N. Y.)*



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Use DULAC Clear Universal Lacquer #462 if you want an air-drying lacquer—CODUR Clear Synthetic Y743 for baking. They both give the same exceptional performance. Write for free Technical Data Bulletin #110, or let our M & W technical consultants discuss your requirements with you.

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PACIFIC COAST DIVISION: SMITH-DAVIS CO., 10751 VENICE BOULEVARD, LOS ANGELES 34, CAL.

MANUFACTURERS OF INDUSTRIAL FINISHES

II. Sulfate-Chloride Bath.

	g./l.	oz./gal.
Ferrous sulfate ($FeSO_4.7H_2O$)	250	33.0
Ferrous chloride ($FeCl_2.2H_2O$)	36	4.8
Ammonium chloride (NH_4Cl)	20	2.7
Operating Conditions:		
Temperature	80 to 160 deg. F.	
Current density	20 to 100 amp./sq. ft.	
pH	3.5 to 5.5	
Agitation	Moving cathode rod only	

Commercial salts are used in this bath. Commercial ferrous chloride is now manufactured in the dihydrate form. Tanks, anode bag materials, anodes and heating equipment are the same as used in the sulfate solution. High current densities are possible with the solution operating at the higher end of the temperature range at low pH and with cathode agitation. If low current densities are to be used, the solution can be operated at room temperature, high pH and without agitation. Hard deposits are obtained with high current densities, low temperature, low pH and low iron content. This bath can also be used in the graphic arts industry on stereotypes and electrotypes. When this iron solution is used for plating electrotypes it must be closely controlled. The optimum bath temperature depends upon the molding medium used. Tenaplate and vinylite molds must be plated in a bath temperature not higher than 110 deg. F. Lead molds can be subjected

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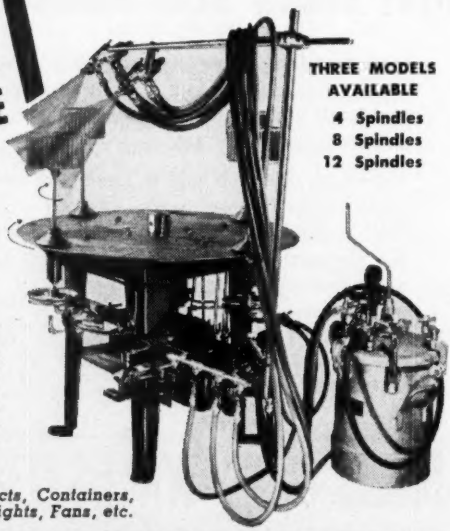

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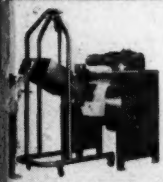

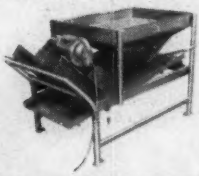

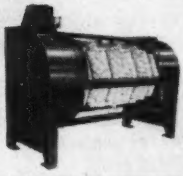

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Advanced barrel finishing is the only mass finishing method with absolute control over results. It is possible to produce almost any desired finish. The Almco Supersheen process is used in a multitude of operations — deburring, grinding, cutting down, cleaning, improving surface finish, reducing surface porosity, finishing threaded and intricate parts, removing paint, coloring, burnishing, etc.

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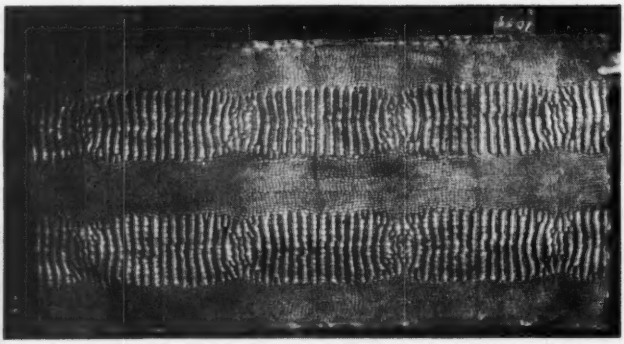

Fig. 7 — Electroforming graining plates. Metallic master with alligator pattern. (*Photo courtesy F. A. Ringler Co., New York, N. Y.*)

●

to much higher temperatures. Iron is deposited on the nickel facing, making it possible to replace all or part of the copper. An all-iron electrotype has not been successful and is not recommended. If nickel is not available, an iron face-copper construction is possible with a flash of cyanide copper on the iron surface prior to acid copper deposition. The backing-up operation on this electrotype can take place directly on the iron, which is flashed with tin prior to casting the electrotype metal.

In preparing the bath shown below, chemicals are thoroughly dissolved, the solution heated to 190 to 200 deg. F. and the pH lowered to about 0.8. Next, ferric iron is thoroughly reduced by electrolysis or by the addition of chemically pure iron filings and commercial muratic acid. The above pH and temperature should be maintained during the reduction of the fer-

III. The All-Chloride Bath.

	g./l.	oz./gal.
Ferrous chloride	450	60.3
Calcium chloride	125	16.8
Operating Conditions:		
Temperature	190- 200 deg. F.	
Current density	20 to 80 amp./sq. ft. without agitation 200 amp./sq. ft. with agitation or rotation of work	
pH	0.5-1.5	
Agitation	Cathode rod agitation	
Iron content	160 g./1.	

Materials and Equipment:

Commercial dihydrate ferrous chloride
Commercial calcium chloride
Armco iron anodes
Glass cloth or synthetic anode bags
Steel rubber-lined tank, covered inside and outside
Karbate bayonet type heater or heat exchanger
Six-volt generator or rectifier
Automatic hot water feed to maintain solution level
Haveg steam circulator
Ventilating ducts are desirable but if the tank should be installed next to an outside wall, a general exhaust fan above the tank is adequate.

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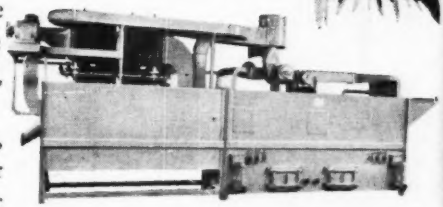

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TABLE I

Comparison of Physical Properties

	Aluminum	Copper	Cast Iron	Steel	Electrolytic Iron
Melting Point deg. F.	1,217	1,982	2,200	2,500	2,786
Annealing Point deg. F. (approx.)	650-750	930		1,110-1,382	1,110-1,663
Coefficient Linear Expansion per deg. F.	$13x10^{-6}$	$9x10^{-6}$	$5.9x10^{-6}$	$6x10^{-6}$	$6.6x10^{-6}$
Specific Gravity	2.71	8.89		7.83	7.87
Wt. in lb. per cu. in.	0.0978	0.321		0.283	0.2842
Tensile Strength (approx.) lb. per sq. in.	12,000-30,000	25,000-40,000	18,000-50,000	55,000-65,000	50,000
Elongation per cent in 2 in.	60.	4.			40
Brinell Hardness (annealed)	15.	103.	132-270		155-165
Brinell Hardness as formed (unannealed)					215-270
Rockell C Case Hardness after carburizing and quenching in water					63-65

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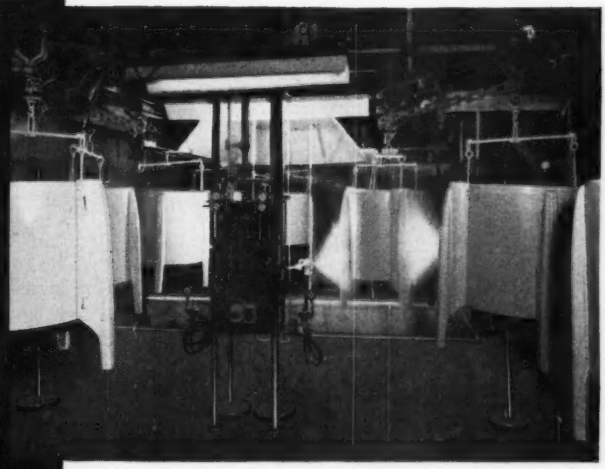

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ric iron to the ferrous condition. When this has been accomplished, the solution will have a deep green color. Care should be taken against the introduction of sulfate, nitrates, copper, lead and any organic material. Copper and lead are undesirable contaminants although, fortunately, either can be eliminated by low current density electrolysis.

Electrolytic iron produced in the all-chloride solution is normally soft, ductile and relatively stress-free. In order to obtain deposits of this quality, temperatures of 190 to 200 deg. F., pH of 1.0, current densities of 20 to 80 amp./sq. ft., and an iron content of 150 to 160 g./l. must be maintained. If higher current densities are employed, cathode rod agitation is essential. Deposits of greater hardness but with increased brittleness result from decreasing the metal content. An oxidized iron plating solution will produce hard, brittle deposits.

Electrodeposited iron is of high purity; some analyses have indicated an iron content of 99.8 per cent, the remaining 0.2 per cent comprising traces of nickel, manganese, copper and carbon. Its crystal structure is needle-like and it has a tensile strength of about 50,000 to 55,000 p.s.i. It can be welded, heat treated similar to low carbon steel and can be readily machined. This material can be hardened by carburizing, nitriding and by other conventional methods. Hardness values up to 63 on the Rockwell C scale have been obtained. Physical property comparisons with other metals are shown in Table I.

Applications

Electrolytic iron finds use in three general fields: re-sizing worn parts, coating, and electroforming.

The buildup of worn and mis-machined parts was used extensively during World Wars I and II. A large number of tools and diesel cylinder liners were salvaged with iron deposition. Some of the iron coated cylinder liners were machined to size, and wear comparisons were made with liners that had been chromium plated over the iron. Although the wear on the iron was greater than on the iron-chromium construction, the former proved to be quite satisfactory.

The coating of non-conductors has a rather limited use. During the past war, probably the largest electroforming unit in the country produced many iron coated wood antennae masts as illustrated in Fig. 2. Recently, composite iron and nickel coatings on

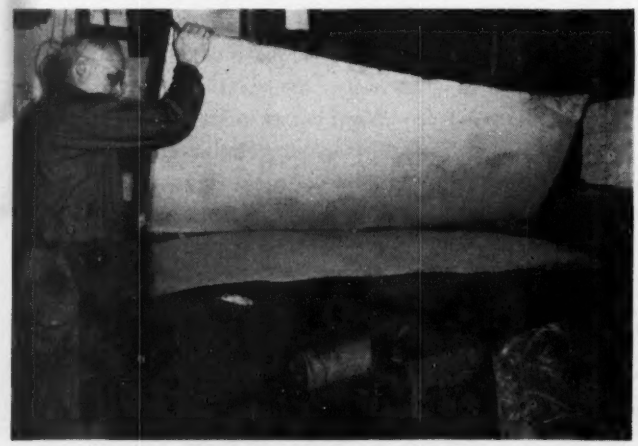

Fig. 8 — Electroforming graining plates. Separation of electroform from master. The iron deposit is 1/16-inch thick for patterns with small detail; thicker for coarse patterns such as alligator or sharkskin. Iron is deposited by the "EKKO" Process. *(Photo courtesy F. A. Ringler Co., New York, N. Y.)*

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wood and aluminum propeller blades have stirred a great deal of interest. Figures 1 and 2 show plated propeller

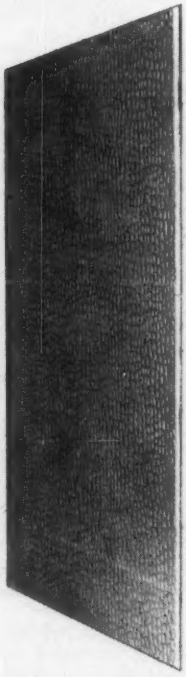

Fig. 9 — Completed graining plate. The iron electroform has been ground on the back, tinned, and sweated to a rigid steel back. *(Photo courtesy F. A. Ringler Co., New York, N. Y.)*

blades that have a film of rubber interposed between the plated metals and the base material.

Experimentally, it was also demonstrated that iron could be plated directly on aluminum without an intermediate layer of other metals. This iron coating was suggested primarily for wear and it proved to be quite satisfactory on aircraft aluminum pistons as shown in Fig. 4.

The graphic arts industry has already felt the shortage of nickel and as a substitute, iron coatings are being tested for use on stereotypes. The sequence of operations in the manufacture of a stereotype printing plate is as follows:

1. Type form pressure molded into moist paper matrix.

2. Paper matrix dried.

3. Matrix cast in curved casting box for curved stereoplate.

5. Cast stereoplate given rough machining and routed prior to nickel plating.

6. Stereoplate nickel plated with deposit 0.001-inch thick.

7. Bevel edges trimmed accurately and plate given final machining operations.

8. Stereoplates locked on press cylinder for printing.

In this sequence, iron plating can replace nickel plating in step No. 6. The pre-nickel plating treatment is satisfactory for iron deposition.

Electroforming, which is the manufacturing or reproduction of articles by the electrodeposition of metals on matrices or patterns, made its greatest progress through the use of electrolytic iron. One of the oldest electroforming applications is employed in the electrotyping industry for the reproduction of printers' type. Later applications include the reproduction of phonograph matrices, molds, leather embossing dies, manufacturing of seamless tubes and metallic foils. Modern techniques have facilitated the manufacturing of precision parts requiring close tolerances and the duplication of fine internal surfaces such as radar plumbing, various machined surface standards and more recently, geometric standards. Figure 5 demonstrates a set of surface standards manufactured by electroforming. It is interesting to note that there is a faithful duplication of the originals

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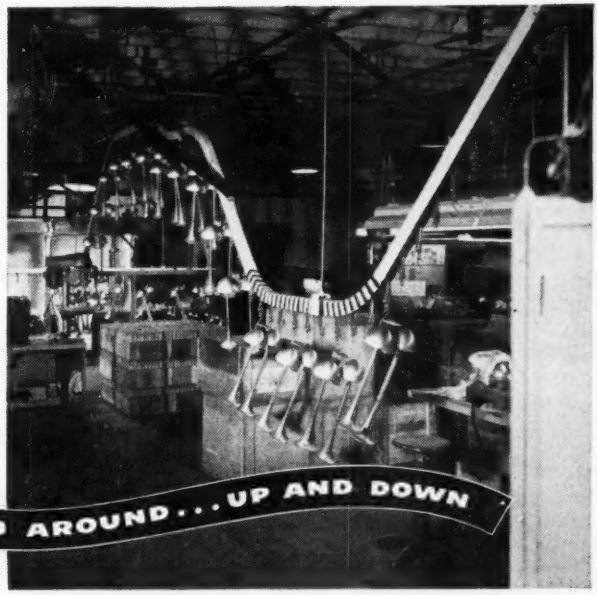

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Once basic techniques are understood, electroforming operations are rather simple and produce uniform results. The normal steps include starting from an original master, taking a matrix from the master and then processing the matrix to electroform the exact duplicate of the master pattern. The greatest difficulties are usually found in manufacturing of the matrix and the selection of the material used to make the matrix. There are various types of matrices which can be used. These matrices are classed as either permanent or expendable, and they are normally engraved, machined, electroformed, cast, sprayed with molten metals or etched. Record stamper matrices and leather embossing die masters in copper are excellent examples of permanent matrices, while wax electrotype molds are expendable.

Engraved matrices are usually employed in the manufacturing of molds such as leather embossing dies and more recently, slide rule molds. An engraved graining plate is used in the electroforming of a copper matrix (Fig. 7) by first treating the surface with a film of turpentine or a very dilute solution of rubber, which is then rubbed with a micronized graphite.

Fig. 10—Phonograph record stamper—nickel face flashed with chromium.

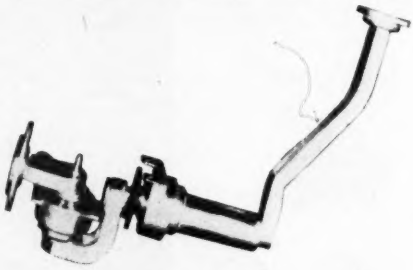

Fig. 11 — Radar wave guide assembly comprising three electroformed nickel sections.
(Photo courtesy Bone Engineering Co., Glendale, Calif.)

After the copper matrix has been treated, it is then plated in the iron solution to a thickness of about 0.060 inch. Figure 8 shows the separation of the electroformed iron shell from the matrix, and Fig. 9 illustrates the completed graining plate consisting of the iron shell mounted on a $\frac{5}{16}$-inch backing plate. The record master in Fig. 10 also demonstrates a permanent electroformed matrix. The stamper is manufactured by passivating the face of the mother with a dichromate solution, then plating it in a nickel solution to a thickness of about 0.0005 inch and finally transferring it to the iron solution to be plated to an overall thickness of 0.015 to 0.020 inch.

Machined matrices are either permanent or expendable. Excellent examples of articles manufactured by the use of permanently machined matrices are radar plumbing and accurate seamless tubing. The permanent mandrels are accurately machined to an outside diameter of 0.0005 inch smaller than the required internal dimension of the finished part. The 0.0005 inch is plated up very accurately with either lead or its alloys and then iron is plated over this film. The electroformed assembly is immersed in a hot

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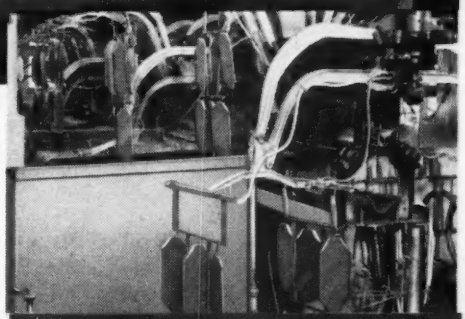

The use of Stevens Automatic Barrel and Automatic Plating equipment for plating washing machine parts at The Maytag Company plant in Newton, Iowa, has improved plating quality about 70%, according to T. H. Upton, superintendent of metal treating.

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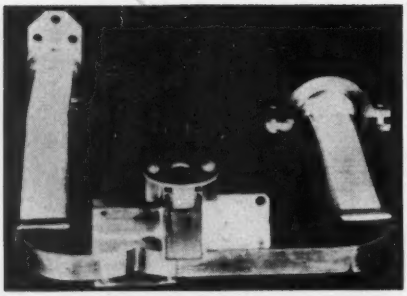


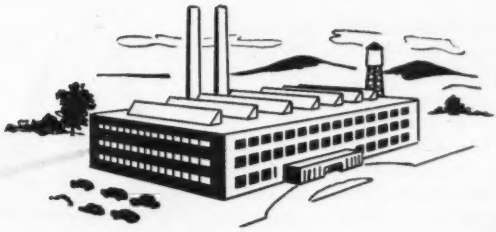
Fig. 12—Nickel electroforming. Duplex mixer wave guide assembly electroformed in nickel. *(Photo courtesy Bone Engineering Co., Glendale, Calif.)*

oil bath and the seamless tube with accurate dimensions is slipped off. The mandrels are used repeatedly. This tubing is used in shock absorber assemblies, for example. Since the inside diameter of all tubing is the same, the machined pistons can be interchanged among the electroformed tubes without difficulty. Expendable machined mandrels can be used in the production of intricately shaped radar parts. Figures 11 and 12 are odd shaped radar assemblies manufactured from this type of mandrel. Solid zinc or aluminum mandrels are actually machined to size, finished to the desired surface and, after plating to the desired wall thickness, chemically dissolved to leave the electroform intact.

The radar feed horn in Fig. 13, the computing cam in Fig. 14 and the surface roughness standards were manufactured from matrices produced by casting techniques. A large bronze mold is employed to slush-cast lead alloy patterns for the electroforming of the large feed horn. The pattern is corrected for dimension, buffed to the desired finish and then electroformed in a nickel-iron-nickel construction. The pattern is melted out of the electroformed shell, resulting in a one-piece radar feed horn which includes a flare, a 180-degree bend, and a 90-degree twist. The inside surface is smooth, accurate and the entire horn weighs approximately 15 pounds. Weight is a vital factor in radar sections to keep the entire assembly as light as possible. The matrices for the computing cam and surface roughness standards were also cast, but with a hobbing technique. The molten low-melting lead alloy was poured on a preheated master, then cooled under heavy pressures. The patterns are exact reverses, duplicating all dimensions and finish of the original master. Here again the lead alloy is melted away from the nickel-iron electroform.

A sprayed metal matrix is employed in the reproduction of certain types of molds. Electroformed iron molds are not recommended for high pressure molding, unless they are hardened and the slight distortion obtained is not undesirable. The low pressure molding field can definitely use the above molds without hardening. The athletic equipment industry is now using electroformed iron molds for the produc-

Fig. 13—Radar feed horn electroformed by the "EKKO" Process. This horn is in one piece and includes a flare, a 180-deg. bend, and a 90-deg. twist. The inside surface must be accurate and smooth with a silver lining. Overall weight is reduced by a preferential buildup on corners to increase rigidity. *(Photo courtesy U. S. Rubber Co., Norwalk, Conn.)*



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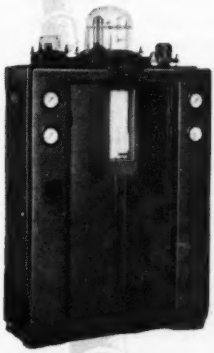

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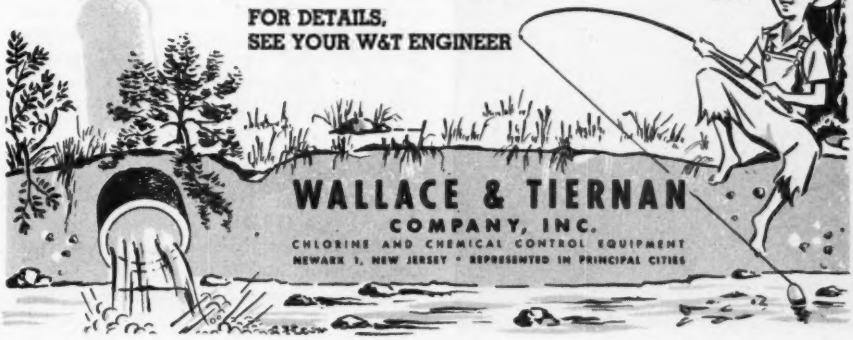

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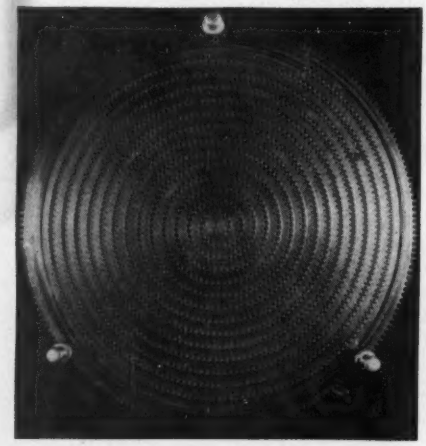
tion of rubber basket balls, footballs, softballs and so on. Figure 15 is an electroformed football mold which was made from an original ball. A latex rubber mold was taken from the original and it was then backed up with Plaster-of-Paris. A molten lead alloy was then sprayed into the latex mold to a thickness of approximately ¼ inch. The sprayed metal pattern was then removed from the mold, treated, and plated in an iron solution to a wall thickness of $\frac{5}{16}$ inch. The lead pattern was then melted out of the electroformed shell which was finally chromium plated for molding purposes.

Etched matrices are normally used as originals in the graphic arts industry. A four-color printing job will require four etched copper originals which are rather expensive. These originals are then used to electroform duplicate originals which will be used in the production of the printing plate.

Fig. 14—Computing cam used in coastal gun batteries. This complex cam is built up by electroforming in laminations of nickel and iron. It represents the precision which can be obtained through electroforming and also illustrates the throwing power of the process as the recording protrusions on the face of the cam are built up of solid metal by throwing into each cavity.
(Photo courtesy U. S. Rubber Co., Norwalk, Conn.)



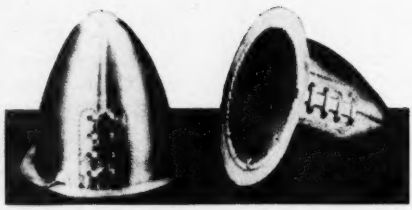


Fig. 15 — Nickel electroformed wax casting molds made from sprayed lead-base (low melting lead alloy) forms.
(Photo courtesy Bone Engineering Co., Glendale, Calif.)

Conclusion

The electrodeposition of iron is a simple process, once experience with the bath has overcome the natural prejudice in working with a new medium. The composition of the preferred solution includes only simple chemicals. Once the ferric iron has been reduced, the solution operates consistently if the pH and temperature are maintained within specified limits.

Electrodeposited iron cannot be applied universally as a substitute for other metals commonly deposited, but the strong, dense and relatively ductile metal can replace nickel and copper in many applications for electroforming, salvage, repair, wear resistance and as an undercoating for other deposits.

ACKNOWLEDGMENT

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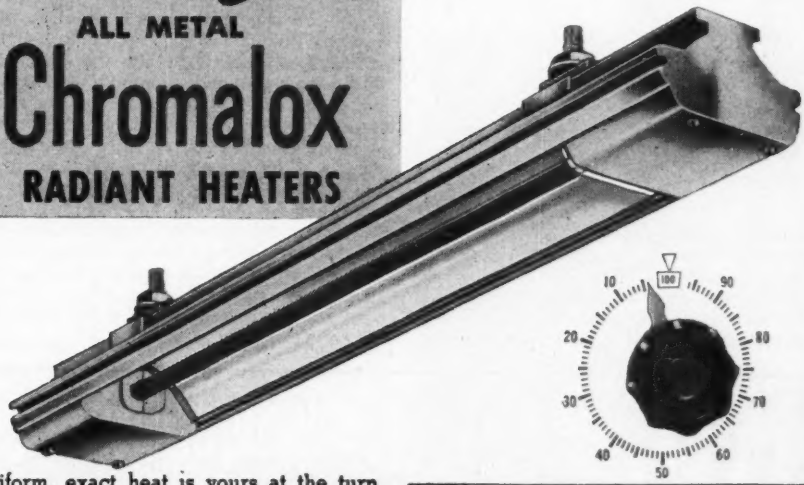

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This article was adapted for publication in PRODUCTS FINISHING from an illustrated talk presented to the Newark Branch of the American Electroplaters' Society.

During 1950, nickel plating continued its growth as one of the major nickel consuming industries. The demand for plating nickel during the first part of 1950 indicated that such use was about one-third greater than any former peak.

While increased demand was apparent in the large field of protective coatings as represented principally by the automotive industry, other newer and smaller uses showed greater relative increases.

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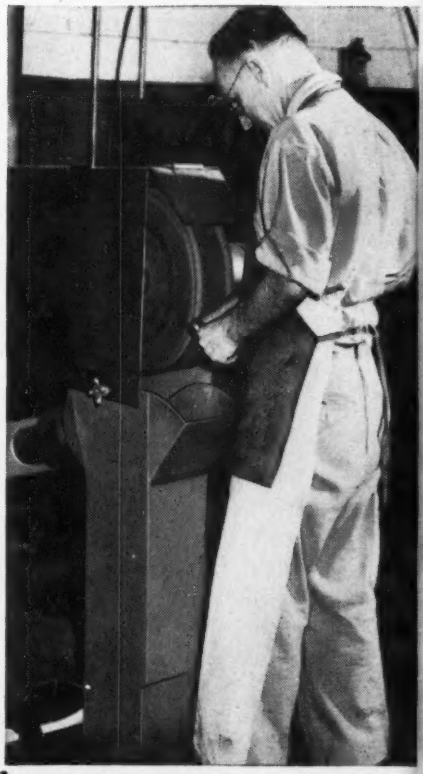

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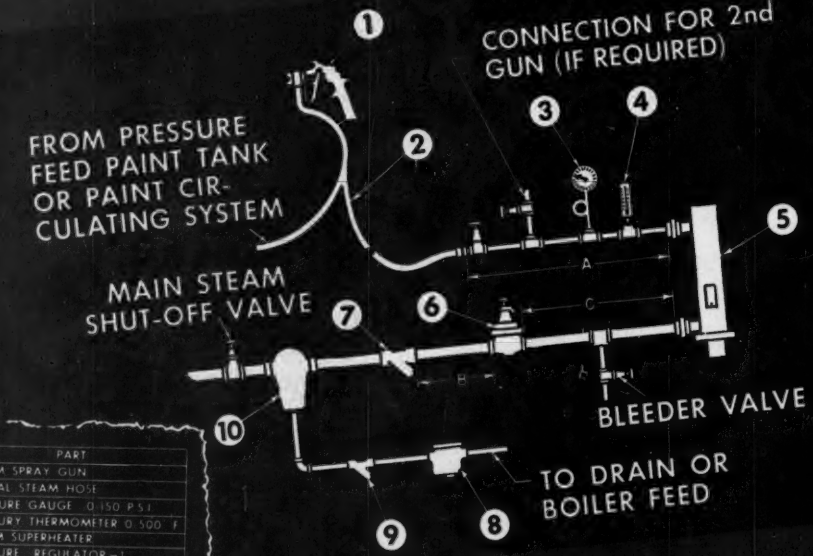

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PLATING COSTS IN A WAR ECONOMY

By W. O. ZINN
President,
National Association of Metal Finishers

THE steady rise in the cost of doing business has indicated the need for constant revision of cost factors in a job plating establishment, if the selling price is to reflect costs accurately.

A great many business men are accepting the apparent inevitable trend of a continuing rise in the price of materials and a continuing rise in the cost of labor over the next few years; so, far from a stabilized economy, we are really looking forward to the continuation of the inflationary trend that has been present for many years.

The plater, and other small business men, can only remain solvent if his knowledge of costs is such as to ensure that his selling price truly reflects these costs. Much progress has been made toward the establishment of a uniform accounting system for use in electroplating establishments, but it is far from universal in its use.

Widespread use of the direct labor hour as a basis for selling price calculations has resulted in considerable improvement as reflected by the reduced number of bankruptcies in the job plating business, but only constant recognition of the changes in costs will keep the direct hour method of cost examination current and effective.

In general practice all the costs of operation of a plant for a month or period are divided by the total number of direct labor hours of work in order to determine the actual cost per direct labor hour to the plant in question. Obviously, the direct labor must be sold at a figure higher than this cost if any profit is to result.

In some plants the direct labor is divided into two or three classes, since the costs per type of work performed are not uniform throughout the plant. For example, the cost in a polishing department might run from $5.00 to $6.00 per hour, whereas in the same plant the cost of operating the plating department might run as high as $40.00 or $50.00 an hour in the gold department and as low as $3.00 or $4.00 per hour in a copper plating or a zinc plating line.

There is no uniformity between plants, due to the various combinations of equipment that might be operated by a man in one plant, and if the same man were moved to another plant, he could be placed on entirely different type equipment where the cost is different and the output is different. So each plant must determine its own costs, and attempt then to reflect these in terms of direct labor hours.

One cost factor often overlooked in estimating and running a job is the cost of packing or otherwise protecting the part that is finished.

Normally, packing and wrapping might be considered overhead factors and therefore included in the cost corresponding to each direct labor hour, but occasionally we find a job where the cost of wrapping, handling, and packing may, in terms of labor required, be equivalent to 30 or 40 per cent or more of what would otherwise be the billing price, and for these special exceptions it is necessary to add a cost factor to cover this unusual cost of packing. Otherwise, a number of these jobs in a plant can so increase the cost of packing that it may be responsible for causing a loss at a time when the

departmental cost of the item appears to be satisfactory.

Because of the different combinations of plating equipment, the cost of producing a given item in different shops can vary as much as 25 per cent, and in some cases more than that, which brings us to a commonly accepted premise that some shops are particularly adapted to handling certain types of work and therefore can produce that type of work at a cost considerably lower than is possible in other shops. On the other hand, the very shop that is lower priced on one item may have a cost on a different type of finish which is just as much higher than the competitor who was high on first item compared.

This characteristic of job plating makes necessary close individual cost control of every job being produced.

The work of the local plating associations throughout the United States and the National Association of Metal Finishers is very closely connected with this need of its membership for information and industry statistics that will help the members to analyze their own operations and arrive at a satisfactory method under which they can remain in business.

In the same sense that there is this variation in the cost of producing a given item, there is also a very wide variation in the so-called normal profit reported by members of the industry. A company operating on an annual volume of one million dollars or more appears to be able to continue in business with net profit after taxes of 4 to 6 per cent. However, companies operating on a smaller annual volume of $200,000 or less may require a profit percentage of 15 to 20 per cent in order to have funds out of which to make the constant changes that are required in the job plating business in order to stay current on methods and therefore maintain a competitive position. The same wide discrepancy is reflected in the executive's salary picture.

Recognizing these variables in the plating industry, we cannot but conclude that one of the best investments that can be made by a plating shop is an adequate cost finding and cost analysis system.

The semi-annual meeting of the board of directors of the **NATIONAL ASSOCIATION OF METAL FINISHERS, INC.**, an organization of job shop electroplaters, took place at the Stevens Hotel in Chicago on January 27, 1951. Those present were: (seated, reading clockwise) W. O. Zinn, president, NAMF, Chicago; A. Betteley, treasurer, NAMF, Detroit; W. F. Walton, vice president, NAMF, Attleboro, Mass.; A. Huber, Detroit; H. E. Coombes, Pasadena, Calif.; D. J. Griffin, vice president, NAMF, Birmingham, Ala.; R. Geisel, Chicago; J. Nelkin, Brooklyn; G. M. Long, Philadelphia; J. Hilfinger, Toledo; A. E. Torney, Chicago; E. T. Brown, Los Angeles; W. Knight, Detroit; G. Burgess, Detroit; A. W. Greenwell, Chicago; H. Karet, Buffalo. (Standing, reading clockwise) J. Mueller, Detroit; L. H. Roemish; Rives Junction, Mich.; R. E. Shock, executive secretary, NAMF, Detroit; A. J. Pavlis, Chicago; F. A. Truden, Nashville; W. B. Oberg, Cleveland; J. T. Hyduke, Cleveland; P. H. Henning, Detroit; J. P. Malooly, Chicago; H. E. DeGrenier, Chicago; L. Presecky, Chicago; E. J. Musick, St. Louis; R. W. Timberlake, vice president, NAMF, Kansas City, Missouri.

How to Dispose of Waste Cyanide Solutions

A DISPOSAL METHOD now coming into wide use is that of oxidizing the cyanide ion to the much less toxic cyanate in a strongly alkaline solution.

CYANATES are about $\frac{1}{1000}$ as toxic as *cyanides*. Accordingly, waste containing 100 ppm cyanide becomes practically non-toxic if the cyanide is all oxidized to cyanate.

THE OXIDATION OF CYANIDE to cyanate is not only rapid, but it appears applicable to almost all types of cyanide wastes.

MANY OXIDIZING AGENTS can be used, but chlorine is probably the most satisfactory and cheapest. It may be fed as a gas, an aqueous solution, or as solid hypochlorite.

FORTUNATELY, after a basic solution of cyanide is oxidized to cyanate, the further addition of chlorine decomposes it to carbon dioxide and probably nitrogen or nitrogen compounds.

PUBLIC SEWERS are generally used as outlets for waste from plants that are not located on streams. Usually, higher concentrations are permissible than in streams, although local conditions and legal requirements dictate allowable practice. Actually, even though cyanates are not particularly poisonous, there is a tendency on the part of pollution control authorities to require destruction of the cyanates.

A.E.S. RESEARCH PROGRAM

THE AMERICAN ELECTROPLATERS' SOCIETY is conducting a comprehensive research program and has developed useful information on current plating problems. International Nickel, in addition to its other support of this program, feels that it will be a further service to make copies of A.E.S. Research Reports available to electroplaters.

THE SUBJECT OF CYANIDE WASTE TREATMENT, approached from different viewpoints, is reviewed in A.E.S. RESEARCH REPORT, Serial No. 14, entitled: "Disposal of Plating Room Wastes." We offer you a free copy of this report. Write for it now.

* * *

On January 1, 1951, National Production Authority Order M-14, respecting the consumption of primary nickel, went into effect and subsequent amendments limit the applications for which nickel and its alloys may be used.

Within these limitations, we shall continue to issue information on new developments and user experience with nickel-containing materials, as we believe that dissemination of such data can help to promote the intelligent utilization of critical materials, so essential in these times.

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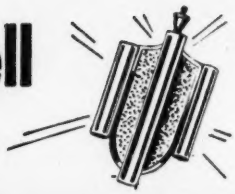
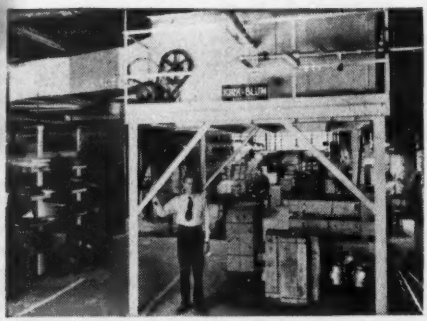


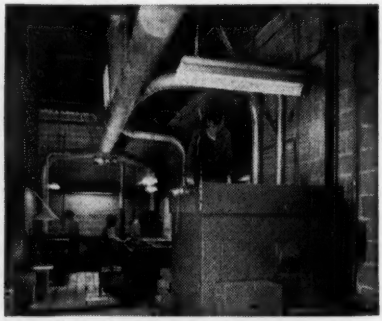
6 KIRK AND BLUM INSTALLATIONS CONTROL DUST and FUMES, SUPPLY MAKE-UP AIR and BAKE FINISHES

A variety of air handling problems in the new plant of NuTone Incorporated were solved by KIRK & BLUM Engineers. Shown here are the various installations which were designed, fabricated and installed by KIRK & BLUM.

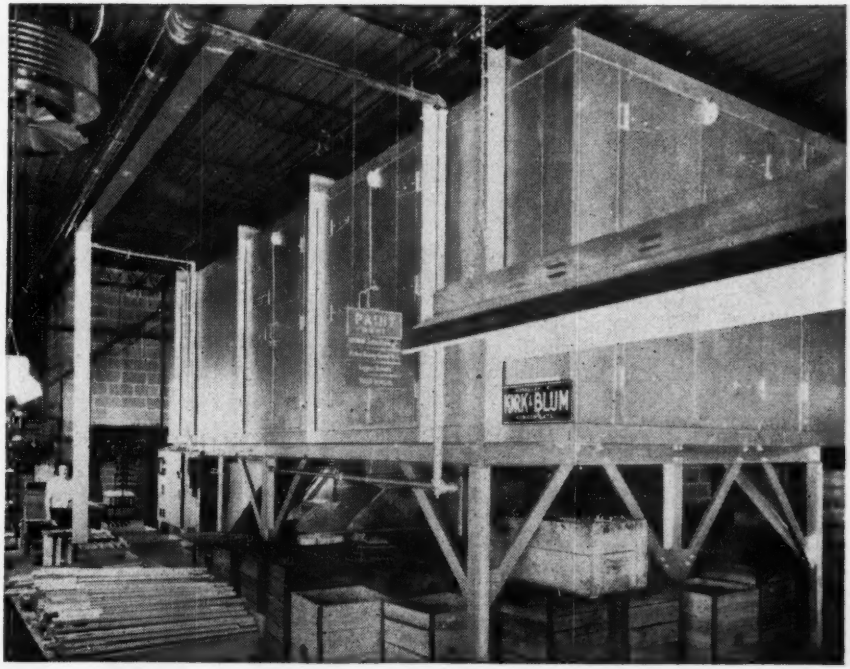
The systems include: 2 Dust Control Systems, a Degreasing and Acid Etching Ventilation System, 2 Paint Booth Installations, Paint Drying Oven and Conveyor and a Make-up Air Supply System. The Make-up Air Supply eliminates undesirable winter drafts in the plant, filtering, heating and distributing air to replace that exhausted by other systems.



"Make-up" air supply system replaces air exhausted from plant.



Fume Removal System in the Acid Etching and Degreasing department.



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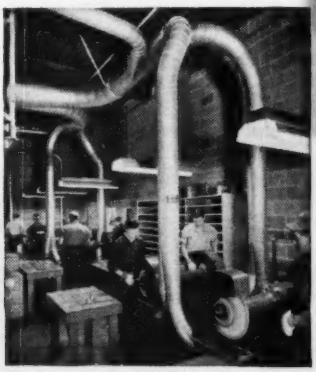
Two KIRK & BLUM Dust Control Systems serve the polishing and buffing room.



FOR CLEAN AIR . . . THE TOOL
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DUST AND FUME CONTROL SYSTEMS
INDUSTRIAL OVENS

Spotlighting FINISHING Progress

Fundamentals of Electrocleaning

ALTHOUGH surface preparation for metal product finishing may involve several processes or steps, cleaning is certainly one important operation in the overall sequence. From the electroplater's viewpoint, a clean surface is usually thought of as one carrying no material which interferes with the deposition of a smooth, adherent, satisfactory electroplate.

What are some of the fundamental requirements of a good electrocleaner? This question was answered for members of the Buffalo Branch, American Electroplaters' Society, by Gerald A. Lux, Oakite Products, Inc., at a recent meeting, in a comprehensive discussion of electrocleaning prior to plating. According to Mr. Lux, some of the basic requirements of a good electrocleaner are as follows: (1) high electrical conductivity; (2) wetting, penetrating, emulsifying and deflocculating action; (3) controlled tendency to form a foam blanket; (4) ability to remove smut and solid-particle soil; (5) water softening ability; (6) inhibited to prevent attack and tarnish of non-ferrous metals; (7) proper buffering to maintain optimum pH range; (8) relatively high tolerance to chromic acid contamination.

In any discussion of metal cleaning one question inevitably arises—"What is a clean surface?" In this connection Mr. Lux cited

What's good for the complexion of tin?

... *a brush!* Here's how to make tin plate keep its "steel mill complexion":

To produce and preserve high-quality finish of tin sheets calls for thorough cleaning prior to plating. Otherwise surface imperfections result during plating and costly work must be scrapped.

To clean the sheet, all traces of foreign matter are removed automatically at 1500 feet per minute with Osborn power brushing. Although operating under hot, high-pressure sprays, the Osborn brushes operate around-the-clock, assuring uninterrupted production and highest quality.

Find out how Osborn's improved brushing techniques can help *you* on product finishing and cleaning problems. A survey by your **O**sborn **B**rushing **A**nalyst will demonstrate what power brushing can do. Simply write for an **OBA.** *The Osborn Manufacturing Company, Dept. 420 5401 Hamilton Avenue, Cleveland 14, Ohio.*

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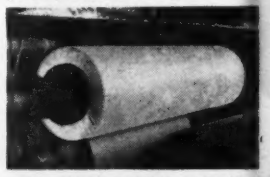
OSBORN power brushing is being used widely by industry on many diversified applications of cleaning or finishing metallic and non-metallic parts. On the work shown below, Osborn power brushing mechanically cleans strip steel prior to electrolytic tin plating.

Continuous sheet scrubbing line at a leading rolling mill.

The continuous sheet scrubbing line in this rolling mill is a vital link in its over-all operation. Any interruptions become extremely costly since they tie up other lines, disrupt production schedules and lose precious man-hours.

Thorough cleaning of the sheet steel prior to tin plating is an absolute necessity. The slightest trace of rolling oil or dirt causes surface blemishes and porosity in the tin coating.



One of six Osborn Heli-Master Brushes used with hot, high-pressure spray.

For continuous, dependable performance at this mill, six Osborn Heli-Master* Brushes perform their mechanical scrubbing job efficiently, day in and day out, and at low end-of-service cost.

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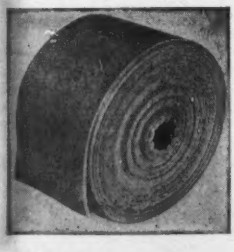
the interpretations given in the paper of E. H. Lyons on this subject, which appeared in the "Transactions of the Electrochemical Society" a few years ago. Lyons developed the thesis that for practical purposes no surfaces are absolutely clean, in the sense of being chemically clean, before plating and that the production of adherent coatings depends upon the elimination of objectionable films, in some cases by substituting harmless films.

Despite the high degree of cleanliness required for the application of electroplated coatings, it is obvious that the wet surface of a metal part ready to be immersed in a plating bath is not chemically clean. Water, and impurities in the water, traces of acid, and metal salts of the acid are present on the surface. Nevertheless, the term cleaning is not inappropriate, and to speak of a "clean" surface is acceptable if these limitations are recognized. A "clean" surface is thus one on which any objectionable films have been replaced by others more suitable for electroplating—a replacement accomplished generally by a series of cleaning steps, and perhaps by the help of the electroplating bath itself, or by both.

In a recent discussion of the principles of preparing surfaces for electroplating, before a Wayne University group, Detroit, Dr. Walter R. Meyer, Enthone, Inc., defined a clean surface as one on which there are no interfering films that are thicker than the order of magnitude of the atomic spacing of the base metal and the deposited metal. He also postulated that on clean surfaces, the depositing metal will tend to form crystals with their characteristic atomic spacings, but with their crystal size the same order of magnitude as the base metal crystals.

Cathodic Vs. Anodic Cleaning

Electroplating, as defined by Mr.



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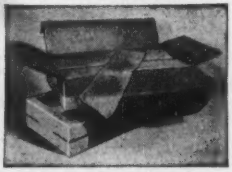

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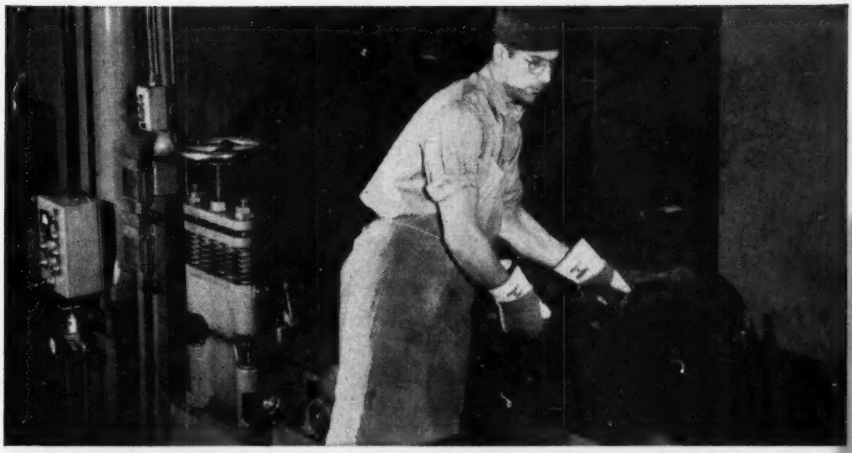

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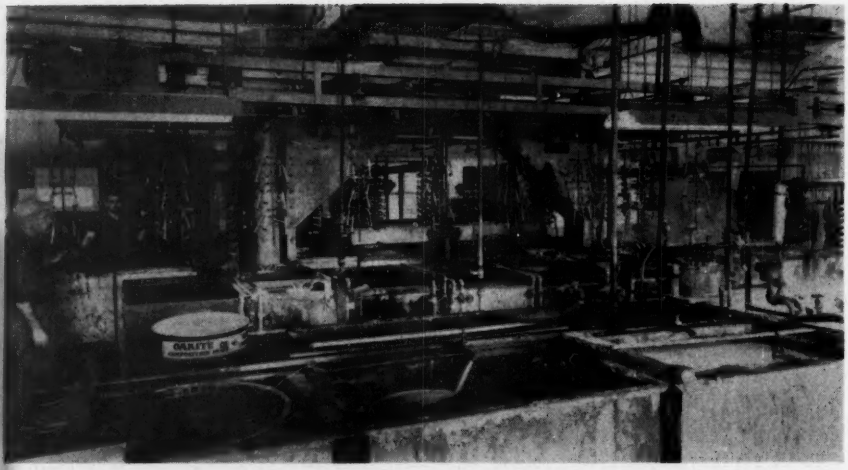

Fig. 1—Cleaning and plating brass parts in automatic machines at Crown City Plating Co., Pasadena, Calif. Soak cleaning is carried out in first two tanks, with direct current in third tank, and reverse current in fourth tank.
(Photo courtesy Oakite Products, Inc., New York 6, N. Y.)

Lux before the group of Buffalo platers, is essentially, a modification of soak tank cleaning in which agitation is supplied by the upward flow of hydrogen bubbles formed by the electrolytic decomposition of water in the cleaning solution. In the process, the parts being cleaned may be made either the cathode or the anode, or in some instances, they are first made the cathode and then the anode. Good practice recommends that parts to be electrocleaned should be properly precleaned. Figure 1 shows automatic cleaning and plating operations on brass parts in which direct current cleaning is followed by reverse current cleaning in separate tanks.

In cathodic cleaning, generally spoken of as direct current cleaning, the part is negatively charged and hydrogen gas is deposited on it. One advantage of this method is that little or no tarnishing or attack of nonferrous metals occurs. Also, greater agitation takes place around parts being cleaned than is the case with anodic cleaning, since the decomposition of water results in two volumes of hydrogen gas and only one volume of oxygen gas. On the other hand, positively charged metal ions will deposit on the work, which may give loose non-adherent surface smuts of metals accidentally dissolved in the cleaning solution. According to Lux, another disadvantage of cathodic cleaning is the deposition of hydrogen on the work, causing hydrogen embrittlement in some metals. Also, there is evidence from laboratory tests that cathodic electrocleaning with solutions contaminated with chromic acid is more apt to produce passive surfaces than anodic electrocleaning.

In anodic electrocleaning, commonly known as reverse current cleaning, the part to be cleaned is positively charged and oxygen gas is generated on its surface. In general, there is little tendency for films to deposit on the surfaces of the parts being cleaned. In fact, it might be said that there is literally a tendency to "unplate" any films or smuts that may be on the surface. To compensate for the

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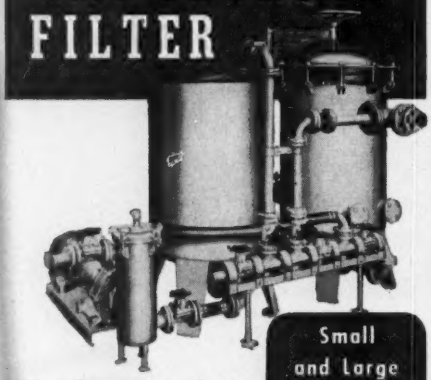

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loss of agitation by the smaller volume of oxygen gas liberated, anodic cleaners generally use higher concentrations to improve conductivity and higher current densities, both of which result in increased oxygen evolution. At the normal current densities used, say up to 75 amp./sq. ft., the oxygen generated shows little tendency to oxidize steel or other ferrous alloys. However, non-ferrous metals will oxidize or tarnish and tend to dissolve, unless the proper inhibitors are present in the cleaning solution. For this reason non-ferrous metals, generally, are anodically cleaned for shorter times and at lower current densities than ferrous metals. Anodic cleaning does not cause embrittlement of hardened steel. The anodic method appears to have a higher tolerance for chromic acid contamination, thus helping to avoid passivation if chromic acid is accidentally introduced into the cleaning solution.

Properties of a Good Electrocleaner

One essential property of a good electrocleaner, brought out by Mr. Lux, is high conductivity. While caustic soda imparts high conductivity to water, it alone is not an effective detergent. It is blended with other alkalies, which have lower conductivity but more detergent action, better rinsing ability, and a lower pH in solution.

For fast, effective action, an electrocleaner should have wetting, penetrating, emulsifying, and deflocculating action. Cleaning solutions generally require the assistance of surface active agents that will wet and penetrate soils, and selectively permit the cleaning solution to destroy the bond between the metal surface and the soil. When the soils have been loosened, the cleaning solution should temporarily emulsify oils and greases and suspend solid-particle dirt in a free rinsing form. One point emphasized was that it is important for the surface active agents to only hold the soil in suspen-

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RR-C-82	"Lithoform" No. 32
MIL-C-5541 (See also QPL-5541-1)	"Alodine"
MIL-S-5002	"Alodine," "Granodine"
JAN-C-490, Grade I	"Granodine"
JAN-F-495	"Granodine," "Lithoform"
JAN-L-548	"Permadine"
AN-E-19	"Alodine," "Zinodine"
AN-F-20	"Alodine," "Granodine," "Lithoform," "Permadine," "Thermoil-Granodine," "Zinodine" (See also U. S. A. 3-213)
U. S. A. 57-0-2	
Type II, Class A	"Thermoil-Granodine"
Type II, Class B	"Permadine"
Type II, Class C	"Granodine"
U. S. A. 51-70-1	
Finish 22.02, Class A	"Thermoil-Granodine"
Finish 22.02, Class B	"Permadine"
Finish 22.02, Class C	"Granodine"
U. S. A. 50-60-1	"Granodine"
U. S. Navord O.S. 675	"Alodine"
U. S. N. Appendix 6	"Lithoform"
Navy Aeronautical M-364	"Permadine," "Thermoil-Granodine"
16E4 (Ships)	"Alodine," "Granodine," "Zinodine"
AN-C-170	(See MIL-C-5541)
U. S. A. 72-53	(See AN-F-20)
AXS-1245	(See JAN-C-490)

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MIL-C-10578	
Type I	"Deoxidine" (Wash-off)
Type II	"Deoxidine" (Wipe-off)
U. S. A. 98-20007	"Deoxidine" No. 424
U. S. N. Appendix 6	"Deoxidine"
U. S. A. 3-213	(See MIL-C-10578)

METAL CLEANING CHEMICALS

Specification Number	*ACP Specification Chemical*
JAN-C-490 Grade II	
Type 2	"Ridoline"
Type 6	"Ridosol"
U. S. A. 3-192	"Ridoline" No. 3192

ACID INHIBITORS, PICKLING

Specification Number	*ACP Specification Chemical*
U. S. N. 51-I-2	"Rodine"

Additional copies of this chart and descriptive folders on ACP Specification Chemicals listed above are available on request.

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sion temporarily, since cleaning solutions which tend to emulsify oils permanently have a relatively short life. When temporary emulsions break, the oils float to the top of the solution where they may be overflowed or skimmed off. In the same manner, solid-particle dirt should settle to the bottom of the tank instead of remaining permanently in suspension.

By lowering the surface tension of the cleaning solution, surface active agents may increase the tendency of the solution to foam during electrolysis. Lux pointed out that a small foam blanket is beneficial on an electrocleaning solution because it traps the alkaline spray resulting from the hydrogen and oxygen gases liberated. However, the bubbles in the blanket should break shortly after they are formed. If they have a high film strength and are long lasting, a thick blanket of explosive foam will be generated and it will be hazardous to remove the parts while the work rod is energized. Satisfactory surface active agents must not decompose under electrolysis or by the action of hot alkali to form undersirable insoluble materials; also, they should not form harmful films on either the anode or cathode. Valuable as they are, organic surface active agents generally are not completely able to deflocculate or temporarily suspend solid-particle dirt. However, cleaners properly compounded with silicates are very effective for this purpose. Silicates also augment surface active agents in their ability to loosen dirt and emulsify oils and greases.

A good electrocleaner must be designed to sequester the calcium and magnesium salts that are in the tap water, and thus prevent a reaction between the soaps in the cleaning solution and the water hardness. Although modern electrocleaners seldom have soaps in their composition, the tendency being to use surface active agents instead, the animal and vegetable oils or greases in buffing compounds removed by the electrocleaning solution are gradually converted into soaps by the action of hot alkalies. These soaps which are generated may form an insoluble, sometimes sticky precipitate with the hardness in the water if the cleaning solution does not contain the proper lime and magnesium sequestering agents. It is also important that cleaner additions be added at regular intervals to ensure that the desired water softening ability is always available.

Electrocleaners used with non-ferrous metals may or may not possess inhibiting action to prevent attack of the base metal during the cleaning operation. If the precleaning operations are particularly effective and the nonferrous metal parts require only a few seconds of anodic cleaning to activate the surface, inhibition of the cleaner is not absolutely necessary. On the

to Page 66→

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Switch to DETROIT "TAC" RAGS and avoid rejects. Remove all dust, lint and sand quickly, efficiently. The standard for 16 years. Order from your supplier today, or send for sample.
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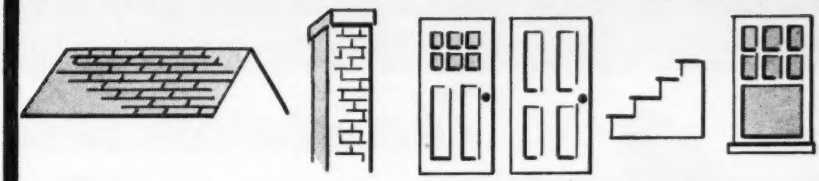

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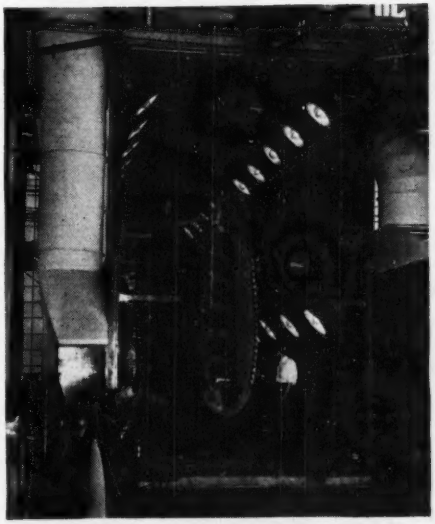

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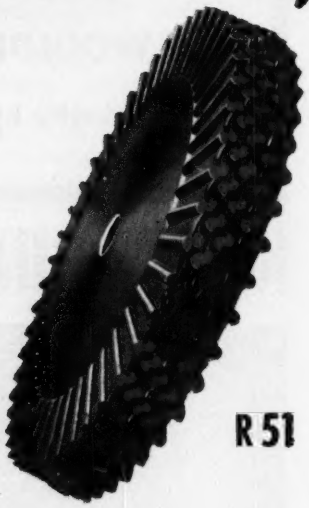
R 51

This is a sectional rubber wheel of rugged construction that promotes the proper flexing action of the abrasive belt for top efficiency in its operation. The flex takes place in a series of short waves in place of one long depression as in the conventional wheel. This short wave or flex has the effect of presenting the abrasive to the work at constantly varying angles. This is an absolute factor in faster cutting, glaze-free and a much longer life for your belt.



R 51

The contact wheel is a very important factor in efficient belt operation and much of this efficiency is lost by operation with too much belt tension. We recommend the lowest amount of tension that will still keep the belt tracking on the wheel. This is true in Hand, Automatic and Semi-Automatic operations.

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Take a discarded belt that is loaded or glazed and will not cut. Run this belt with a COSMOWHEEL and it will continue to cut until all the mineral is worn off. Many belts are discarded when only half worn.

It is important for us to know your operating speed as the wheels are dressed at this speed.

The *R-51* is an interlocking rib type that can be assembled in any width of face and is a very aggressive wheel for stock removal or polishing.

The *R-52* is the same interlocking type but has a Z pattern for finer finishing or contouring.

WHEEL

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* SMOOTHER POLISHING
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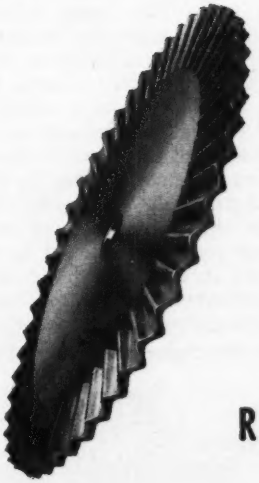

R52

R52

Ask Your Supplier

These wheels are available through the major abrasive companies and their distributors from coast to coast. Or write direct to us giving a description of your work that we may recommend the proper wheel for your requirements.

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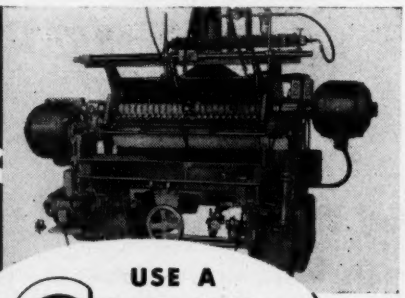
other hand, where a long cleaning cycle is used, it is good practice to use a cleaner which contains an inhibitor to prevent attack of the buffed non-ferrous metal surfaces; some cleaners contain materials which also minimize the possibility of tarnish when the parts are cleaned anodically.

Silicates of the correct type and the proper quantity have been found to be among the most effective inhibiting materials. Use of alkaline materials with a lower pH is another method of minimizing attack of buffed non-ferrous metals. Although the silicates have some tendency to prevent tarnishing, when non-ferrous metals are anodically cleaned, certain organic compounds also may be added to retard this tendency. An example was cited where the combination of these two materials in an electrocleaner permitted brass parts to be soak cleaned for several minutes and finally anodically cleaned up to 60 seconds at high current densities without any tarnishing or loss of luster on the buffed surface. When starting up an electrocleaner, whether inhibited or not, it is good practice to boil the cleaning solution for at least one-half hour before use to eliminate dissolved oxygen in the water.

Buffering action is another important property, since electrocleaners usually work most efficiency in a definite pH range. The most effective cleaners contain sufficient quantities of proper buffering alkalies to maintain the proper pH over several days' operation without frequent additions. One point of practical interest in prolonging the life of the cleaner concerns the method of heating the solution. The use of gas heated tanks which increase the carbon dioxide content of the plating room was stated to have more effect in shortening the life of the electrocleaner than the contamination resulting from removal of most



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Specialized Machine Equipment For Glazing and Polishing Operations
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Now, TODAY, mail your request for detailed facts, figures and illustrated literature No obligation, of course. Address Dept. 11.

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Specialists in cleaning equipment design and manufacture

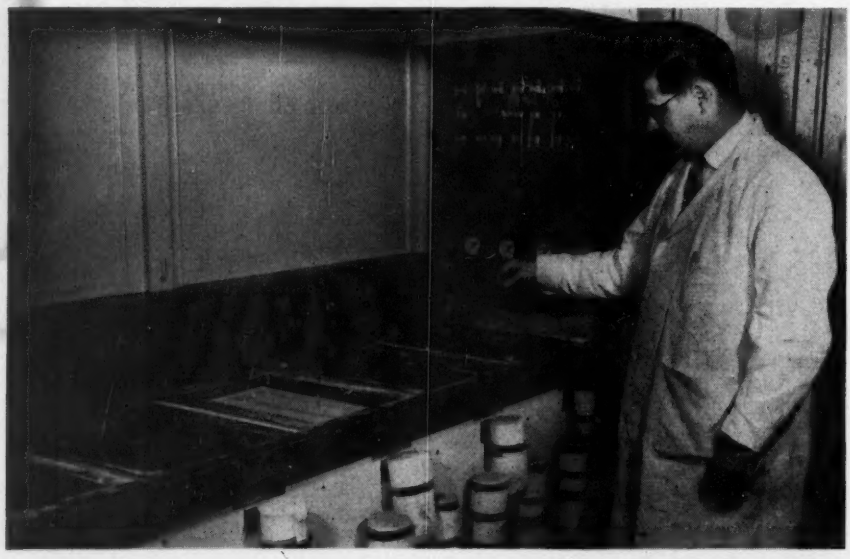
industrial soils. Where possible, immersion gas heating equipment, properly vented to the outside, should be used, if steam or other heating media are not available.

Tolerance to chromic acid contamination is another property which determines the useful life and performance of a commercial cleaner. Mr. Lux cited work conducted in the Oakite Laboratories using an experimental setup such as shown in Figure 2, which indicated that an anodic electrocleaner may have as much as twenty times greater tolerance for chromic acid than cathodic electrocleaners. These tests have also shown that less than five parts per million of chromic acid contamination in the cleaner may cause passivation and poor adherence of electrodeposits when only cathodic cleaning is used. The chromic acid tolerance of a cleaner may be increased by inorganic reducing agents, but these are oxidized by exposure of the solution to the air and by the oxygen gas generated at the anode. Another disadvantage is that some of the hexavalent chromium after being reduced to trivalent chromium may be again re-oxidized back to the harmful hexavalent condition at the anode. A second method involves the use of organic compounds in the cleaner which form non-ionic complexes with the chromic acid.

Proper Use Of Electrocleaner Important

The correct composition of an electrocleaner is not necessarily a guarantee of satisfactory cleaning. It is important that the cleaner be used properly. This includes such factors as preparing the solution according to directions, following recommended conditions of operation, and controlling it by accepted tests and additions. Bus bars, electrical equipment, and meters must be adequate to ensure use of cor-

Fig. 2—Experimental setup for testing a new electrocleaner. *(Photo courtesy Oakite Products, Inc., New York 6, N. Y.)*



to Page 72→

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SAVES UP TO 70%
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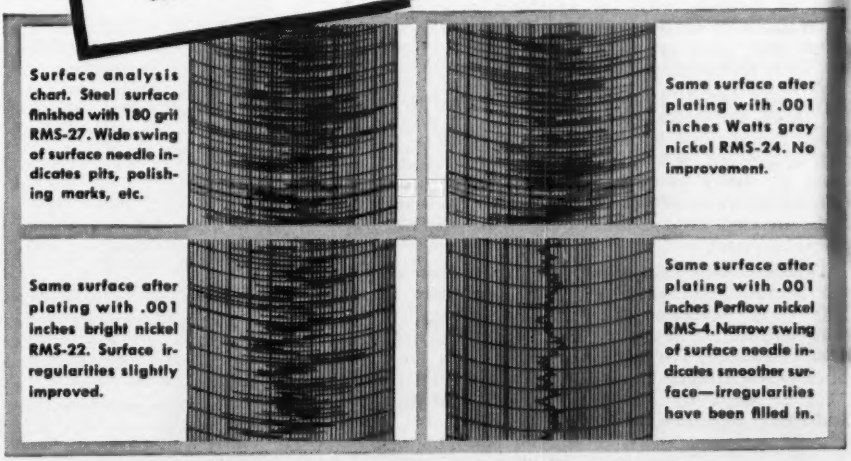
SAVES UP TO 50%
direct labor cost surface preparation

• Perflow nickel plating has the unusual property of filling in scratch marks . . . in most cases to such a degree that it eliminates some costly steps in polishing the base metal prior to plating.

Extensive production experience has proved that as high as 70% of the cost of buffs and buffing compounds, and 50% of buffing labor costs are eliminated in the final nickel finishing, since the Perflow deposit is so easily color-buffed to a brilliant finish.

There are other benefits and other good reasons for using Harshaw Perflow. We'll be glad to furnish you with further information and literature.



Surface analysis chart. Steel surface finished with 180 grit RMS-27. Wide swing of surface needle indicates pits, polishing marks, etc.

Same surface after plating with .001 inches Watts gray nickel RMS-24. No improvement.

Same surface after plating with .001 inches bright nickel RMS-22. Surface irregularities slightly improved.

Same surface after plating with .001 inches Perflow nickel RMS-4. Narrow swing of surface needle indicates smoother surface—irregularities have been filled in.

THE HARSHAW CHEMICAL CO.
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Here's a rich, lustrous answer, in a single package, to a wide range of finishing problems! Dimenso One-Coat provides a dual-purpose, finish that goes on in a *single* coat without need for special spray equipment.

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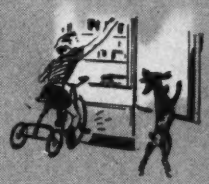
Another Product of Sherwin-Williams Industrial Research — Cover the Earth



TOUGH AND MARPROOF—Kemclad formulations include special ingredients to protect finish against marring, chipping or scratching.

HOT GREASE? NO HARM DONE! — Even hot grease won't damage Kemclad's gleaming white finish!

STAYS WHITE AND STAIN-FREE! — Kemclad Finishes aren't affected by food acids, weak alkalies, alcohols or other common household chemicals.

CLEANS EASILY...SAFELY! —Kemclad's smooth surface cleans easily with damp cloth, but withstands strong detergents safely.

Photo courtesy Gibson Refrigerator Co., Greenville, Michigan

Well engineered...

TO THE LAST 2/1000 OF AN INCH!

The engineering in the last 2/1000 inch of an appliance—its *finish*—may be even more important than for many of its other parts! Leading manufacturers like Gibson Refrigerator Company prefer S-W Kemclad Appliance Finishes because they provide advantages three ways:

- ***Saleswise,*** **they give the white-for-the toughness and beauty that only the newest developments in synthetic resin materials and know-how make possible.**
- ***Productionwise,*** **they reduce rejects and production line problems.**
- ***Costwise,*** **their high solids content with low viscosity makes finishing cost low for any given thickness of finish.**

Investigate what S-W Finishes may mean in your own production set-up! Call, wire or write The Sherwin-Williams Co., Industrial Div., Cleveland 1, Ohio.

SHERWIN - WILLIAMS
APPLIANCE FINISHES

rect current density. Low resistance contacts, clean anode and cathode bars, and periodic scrubbing of the electrodes all contribute to efficient, economical, and satisfactory electrocleaning. In Fig. 3 plant tests are being conducted on an electrocleaner.

Temperature control of the cleaning bath will ensure operation at maximum efficiency without waste of fuel. One system that has been recommended comprises a remote bulb, air-operated, non-indicating temperature controller, which is used with a steel well for the bulb, and a low-lift, V-ported diaphragm steam valve with bronze body and trim. This is illustrated by the drawing in Figure 4. The thermometer bulb should be placed where a representative temperature exists, sufficiently remote from the source of heat. Also, the bulb should be away from the path of current flow to prevent corrosion. Usually the best location is at the end of the tank rather than at the side.

Fig. 3—For proper operation an electrocleaner must be controlled by accepted tests and make-up additions. Here tests are being conducted on an electrocleaner used to clean before plating at the plant of Automatic Polishers, Inc., Los Angeles.
(Photo courtesy Oakite Products, Inc., New York 6, N. Y.)

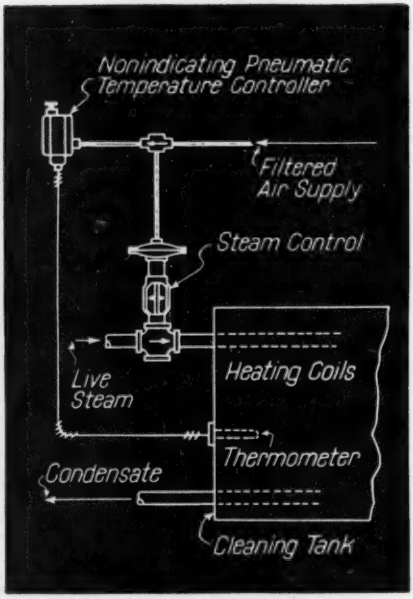


Fig. 4—Diagram of one suggested temperature control system for cleaning tanks.
(Illustration courtesy "Metal Progress")

* * *

Recent Developments in Nitrocellulose Lacquers

SOME improvements in nitrocellulose lacquers that have taken place in the last few years are discussed by J. R. Yeager, Hercules Powder Company in the recent book "Paint And Varnish Technology," edited by William von Fisher, Case Institute of Technology, and published by Reinhold Publishing Corporation. One advance cited by Yeager is the development of high-solids lacquers. Higher solids lacquers serve to decrease the number of coats required in a multiple-coat

you save 50% in TANK HEATING and COOLING with PLATECOIL

(REPLACE PIPE COILS)

★ You SAVE 50% in tank SPACE
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★ You have 50% LESS WEIGHT to handle
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. . . besides all these you get faster heating or cooling. Take advantage of the engineering assistance offered by Kold-Hold to help you with your heat transfer problems.

Send for complete technical manual and descriptive Bulletin No. P50.

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KOLD-HOLD MFG. CO.
LANSING 4, MICHIGAN

Why Platecoils Cost Less

LOW FIRST COST

The initial cost of Platecoil is often 50% or more below the cost of equivalent pipe coil depending, of course, on the materials used in construction.

EASY INSTALLATION

By the use of "quick change hangers" Platecoil installations can be made in open tanks in one-half hour or less by one man and a helper.

NO THREADED JOINTS IN TANK

The entire Platecoil is electric welded and pressure tested. There are no joints to corrode or leak. Both connections to the Platecoil can be located above the liquid level where there is no danger of thread corroding and freezing.

GREATER TANK CAPACITY

A 22" x 47" Platecoil gives the same heat transfer surface as 32 feet of 1½" pipe. This pipe requires a space approximately 30" x 60". Platecoil thus saves about 50% over equivalent pipe coil.

WEIGHS 50% LESS

Weighing only about half as much as equivalent pipe coil, Platecoil is easy to handle. A whole maintenance crew is not needed to transport and install Pipecoil.

TANK MAINTENANCE WITHOUT LOSS OF SOLUTION

There is no need for workmen to get inside the tank in order to make replacements or repairs. A Platecoil can be removed in a matter of minutes with the solution still in the tank.

LITERATURE

The new Platecoil Bulletin furnishes a complete description of the Platecoil method of tank heating. Write for your copy today.

HIGH BTU TRANSFER

More prime surface of Platecoil can be installed in a given area than can be obtained with pipe coil. Thus a more compact Platecoil unit provides much greater BTU transfer per unit area than can be obtained with pipe coil. Quick starts in heating tank solutions mean more hours of productive time.

Kold-Hold Manufacturing Company, Lansing 4, Michigan

system; thus, the amount of work, equipment and floor space required is reduced, and at the same time less solvent is required to lay down a pound of solids. The type of coating composition used may influence typical finishing operations, such as shown in Figure 5, from a number of standpoints.

According to Yeager, several factors were studied in developing high-solids lacquers: (1) viscosity of nitrocellulose; (2) solvent system; (3) ratio of nitrocellulose to resin; (4) choice of resin; (5) temperature of application. As lower-viscosity nitrocellulose is used, higher per cent solids is obtained for any given application viscosity. However, for most practical applications, small changes in the viscosity of the nitrocellulose do not affect the physical properties of the film. Figure 6 shows typical viscosity-concentration curves for low-viscosity-type nitrocelluloses.

Fig. 5—The type of coating composition used may influence typical finishing operations, such as shown above, from a number of standpoints.
(Photo courtesy The DeVilbiss Co., Toledo 1, Ohio)

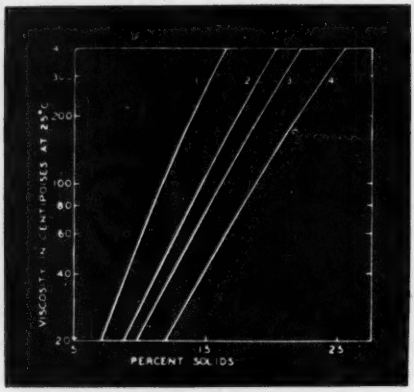

Fig. 6—Viscosity-concentration curves for low-viscosity-type nitrocelluloses in 75 per cent butyl acetate—25 per cent denatured ethanol solvent.
1. RS ½-sec. (125 centipoises)
2. RS ¼-sec. (50 centipoises)
3. RS 30-35 centipoises
4. RS 18-25 centipoises
(Illustration courtesy "Industrial & Engineering Chemistry")

Yeager stated that durability tests over a period of years had indicated that 27 centipoises appeared to be the break point below which tensile strength and durability on orthodox lacquers drop off rather markedly. However, he pointed out that quality finishes can be made from nitrocellulose of lower viscosity by proper formulation. Concerning the ratio of nitrocellulose to resin, studies showed that the general tendency was for higher proportions of resin, relative to nitrocellulose, to give softer films with resultant better cold-check resistance but with excessive dirt pickup and poor water resistance. A ratio of 2 parts resin to 1 part nitrocellulose appeared to be the best combination for all around properties. According to Yeager, the choice of resin to be used depends upon the properties desired in the lacquer film. The non-drying type of alkyd appeared to be generally useful. Other resins may also be used.

Studies recently conducted in General Mills Research Laboratories and

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...ough small, this Cincinnati Cleaning Machine does a big job for this well known automotive and aviation accessory manufacturer. Baskets of widely varying stampings and die castings travel through the machine for cleaning prior to inspection. Many of the parts are easily damaged, have hollows or recesses, yet they are cleaned faster, better and at a saving of 25% over methods previously used.

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reported at the 117th meeting of the American Chemical Society in a paper by Harold Wittcoff, M.H. Baker, and Louis Chaplin, Jr., showed that TMC rosin ester produced harder nitrocellulose lacquer films than did ester gum

Fig. 7—Dr. Harold Wittcoff removes water from a TMC reaction mixture in the General Mills Research Laboratories. This is a step in the preparation of tetramethylolcyclohexanol, a new pentahydric alcohol, which has been tested as an additive in nitrocellulose lacquers. *(Photo courtesy General Mills, Inc., Minneapolis, Minn.)*

and made possible the preparation of solutions with higher solids content. TMC is a cyclic pentahydric alcohol, 2, 2, 6, 6-Tetramethylolcyclohexanol. The rosin ester was produced by reaction with freshly broken WW gum rosin. It was also reported that the TMC rosin ester outperformed maleic modified resins in two ways: (1) it provided lacquer solutions of lower viscosity, and (2) the films from these solutions were more resistant to alkali. Figure 7 shows Dr. Harold Wittcoff removing water from a TMC reaction mixture in the General Mills Research Laboratories, a step in the preparation of tetramethylolcyclohexanol.

The first tests conducted by the General Mills Research workers compared the hardness, abrasion resistance, and flexibility of films from nitrocellulose lacquers formulated with TMC rosin ester and with ester gum. In a standard lacquer formulation, including 10 parts of RS nitrocellulose ½ second, 8 parts of ester gum, 6.26 parts of dibutyl phthalate, 12 parts of ethyl acetate, 24 parts of butyl acetate, and 40.3 parts of toluene, replacement of the ester gum with TMC rosin ester increased the hardness of the resulting film about 50 per cent as is shown in the following data:

LACQUER CONTAINING	SWARD ROCKER HARDNESS	
	24 hour air dry	72 hour air dry
Ester gum	21	32
TMC rosin ester	34	46

The flexibility and abrasion resistance of films from the two compositions were found to be comparable. Abrasion resistance was determined using a Taber Abrasion Tester (Figure 8). Flexibility was determined by bending plates, coated with films 0.003-inch thick over a ⅛-inch mandrel. If the film did not loosen, check or otherwise fail, it was said to have "passed". Additional tests demonstrated that the amount of TMC rosin ester in a standard formulation lacquer could be doubled without sacrificing flexibility to produce compositions with high solids content. To obtain data on this subject standard nitrocellulose lacquer solutions were prepared with 16 parts TMC rosin ester rather than the usual 8 parts.

TMC rosin ester also showed favorable performance in comparison with the maleated rosin esters. In General Mills' experiments, it was tested against four commercial maleated pentaerythritol or glycerol esters of rosin that are widely used in lacquer formulations. In this case, to make the tests strictly comparable, the plasticizer

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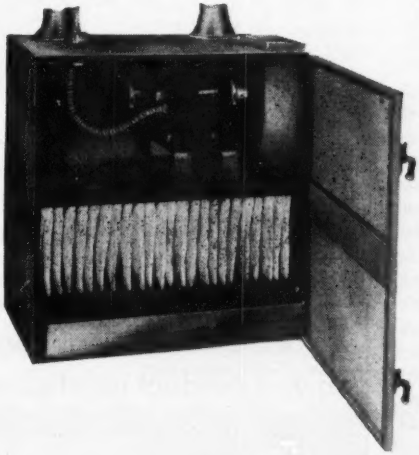

These new HISEY Dust Collectors fill a long felt need for efficient dust collecting at reasonable cost. They are made in four sizes which cover most applications and can be supplied with new machines or for machines already in service.

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Division of The Cincinnati Electrical Tool Co.

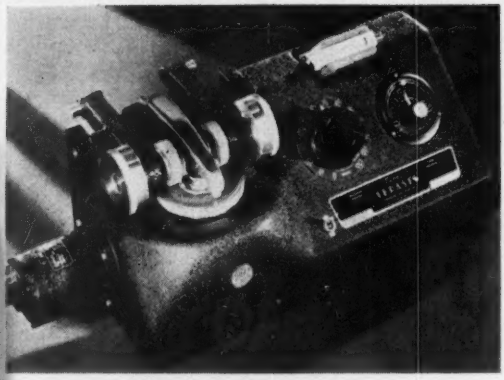


Fig. 8—The Taber Abraser Model 140 may be used for determining the abrasion resistance of protective coatings.
(Photo courtesy Taber Instrument Corp., North Tonawanda, N. Y.)

concentration of all formulations was adjusted so that their 0.0015-inch films had equal hardness after one hour at 55 deg. C. Since the TMC rosin ester is not polymeric, it produced compositions with lower viscosities than those containing the maleic modified resins, whose molecular weights are higher than those of ordinary esters.

Tests showed the hardness of the film containing TMC rosin ester to compare favorably with that of lacquers prepared from the other resins. The lacquers made with TMC rosin ester performed on a par with those containing maleic modified resins from the standpoint of flexibility and abrasion resistance. The TMC rosin ester also gave comparable results in drying time tests. Water and alkali resistance of the lacquers were determined by coating test tubes, allowing the resulting films to dry at room temperature for 72 hours, and then immersing the tubes in water at room temperature and in 5 per cent sodium hydroxide. The results showed that TMC rosin ester produced nitrocellulose lacquer with exceptionally good alkali resistance.

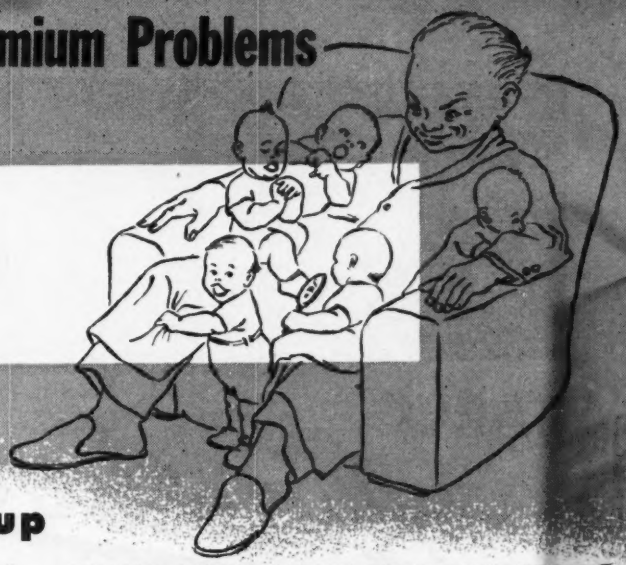
All of the nitrocellulose lacquer films were reported to show excellent gloss, with no detectable difference among those made from different resins. Tests conducted on print resistance showed that the TMC rosin ester was virtually print resistant after 96 hours at room temperature. Studies conducted to determine the rates at which solvents escape from the lacquer solutions showed that lacquer containing the TMC rosin ester did not lose quite as much solvent as did the other compositions, but did lose its maximum amount of solvent rapidly. The General Mills' research workers suggest that because the rosin ester of TMC is highly compatible with nitrocellulose in the presence of plasticizers, is superior to ester gum in many lacquer compositions and, in controlled tests, has at least equalled maleated resins in overall performance, it appears to be a potentially valuable lacquer additive.

Through a recent change in the Canadian Precious Metals Marketing Act palladium articles made of that precious metal must henceforth carry markings of the actual metal fineness. Palladium is a by-product of nickel refining and is produced in great quantity in Canada.

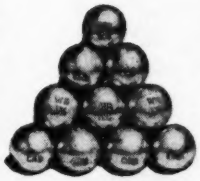
For further information on any product mentioned in this issue—use the READER SERVICE CARD between the covers.

Dump your Cadmium Problems

in the WAGNER LAP



We're set up to relieve you in *FIVE IMPORTANT WAYS!*



Your cadmium plating problems may be with you right now—or they may be just around the corner. Perhaps you're converting from a 'peace time' finish—maybe you're starting on a new defense product which specifies cadmium. Whatever your situation, experienced with cadmium or not, we can help you. For example—

PROBLEM No. 1—Restrictions: If you're all bound up in red tape, can't unravel the latest from Washington, we'll gladly give counsel, the consensus of industry's thinking, interpretations—many right from the mouth of the horse.

PROBLEM No. 2—Metal: We offer you a reliable, *primary* anode source—and Wabrite cadmium, the pure, smooth, bright cadmium ball you can't mistake for any other metal. If your order is rated, we'll ship cadmium till the world looks level.

PROBLEM No. 3—Supplies: We'll start you off right—with our cadmium solution, Wabrite M3X, a three-times concentrated electrolyte, mixed, filtered, purified, plus our proprietary compound.

PROBLEM No. 4—Equipment: We're ready and qualified to set up your complete plating department or any part of it—from tanks, degreasers, rectifiers, barrels, racks to a modern, automatic plating system.

PROBLEM No. 5—Production: Our field engineers are *plating men,* ready to pitch in, keep you going at top efficiency. Our experimental laboratory, pilot plating plant and skilled technicians and metallurgists are at your service.

Get rid of your plating headache! Put in a call to us and we'll have our nearest field engineer rapping on your door. Use the coupon, if you prefer; either way will get sudden action.

Wagner BROTHERS INC.

432 MIDLAND DETROIT 3, MICH.

Wagner Bros., Inc., 432 Midland, Detroit 3, Michigan

I have cadmium plating problems.

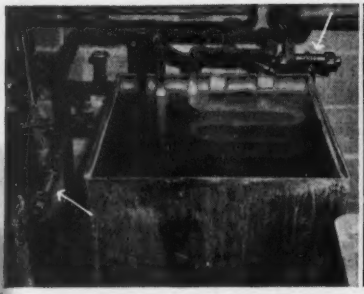
☐ **Phone me immediately or** ☐ **Have representative call.**

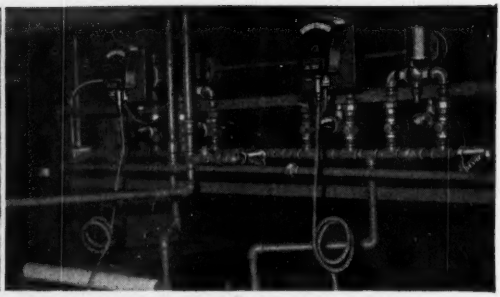
Name _____ **Title** _____

Firm _____

Address _____

City _____ **Zone** ____ **State** _____





SARCO *Autothermic* PLATING

You may not be able to make your present equipment completely automatic but you can make it automatic as far as temperatures are concerned at very small cost. That means that no matter how the temperatures and pressures of your steam and water supply vary, or how you are loading the tanks, the temperatures will be within a degree of the point at which you set the dials of the Sarco LSI Plating Control.

It also means that you can change the settings in a second for each tank and each load. This includes all kinds of plating, and alternate heating and cooling. It means that you can read the temperatures on the big dial, custom-cut, for easy reading in your temperature range.

For wash tanks a low cost Sarco Thermoton hooked into the line like an elbow will hold the tank within a few degrees. And for degreasers you can select the Sarco Vapor-line Controls, or the Sarco TR-40 Cooling Control. To save steam, Sarco Traps and Strainers are recommended for each tank or steam coil.

ASK FOR SARCO BULLETINS ON PLATING CONTROL

270

SARCO COMPANY, INC.

Represented in Principal Cities

Empire State Building, New York 1, N. Y.

SARCO CANADA, LTD., TORONTO 5, ONTARIO

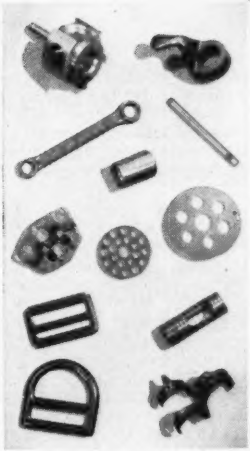
SARCO SAVES STEAM

IMPROVES PRODUCT QUALITY AND OUTPUT

ROTO FINISH

GIVES YOU 5 OUTSTANDING ADVANTAGES

for Deburring, Descaling and Finishing Operations



1. Eliminates tedious hand filing, scraping, polishing, deburring, etc. to save many man hours.
2. Provides absolute uniformity in quantity lots.
3. Maintains exacting tolerances on precision parts where no dimensional change is allowable.
4. Imparts a finish mechanically that was formerly considered possible only by hand methods.
5. Low initial cost — requires minimum maintenance. No exhaust systems required.

Send samples for free demonstration

ROTO-FINISH GUARANTEES RESULTS

HERE'S THE WAY IT WORKS

You buy nothing until analysis proves results will benefit you.

LABORATORY ANALYSIS

Your products are analyzed to determine which combination of equipment and materials will do the best job for you at the lowest cost . . . before you make any investment.

RESULTS GUARANTEED

We guarantee to reproduce the same results in your plant that we have produced on your samples processed in our laboratory.

A COMBINATION OF MATERIALS AND MACHINES

When you buy, you get machines and materials that are properly combined for your job.

Roto-Finish COMPANY

associated with The Sturgis Products Co.

3704 MILHAM RD., KALAMAZOO, MICHIGAN

ORIGINATORS OF THE ROTO-FINISH PROCESSES

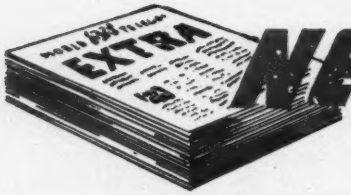
ENGINEERING KNOW-HOW

Avail yourself of the unusual engineering skill and ability which is found at the Roto-Finish Company.

CONTINUOUS ENGINEERING SERVICE

Roto-Finish Engineers make periodic visits to your plant to supervise and demonstrate the use of Roto-Finish processes, to train your operators, and to offer helpful suggestions to improve your products wherever possible.

ROTO-FINISH COMPANY, Kalamazoo, Michigan



NEWS of the Industry

NEW PLANTS

The plant of **EMPIRE SOLVENTS, INC,.** manufacturer of Empire Black, an improved black oxide for steel, has moved to Clifton, New Jersey. The general offices and laboratory are now located at 153 East 26th St., New York 10, N. Y. The company has representation in all principal cities.

COMPANIES

The **TECHNICAL TAPE CORPORATION** has announced that it has created a new advertising department, streamlined to coordinate the advertising and sales promotion of all its factories and warehouses throughout the United States and Canada.

Named director of advertising and sales promotion is J. Jess Colby, former newspaper columnist and advertising agency executive.

Headquarters for the new departmental setup has been established at the executive offices and main plant of the Technical Tape Corporation, 177th Street and Harlem River, Bronx, New York.

THE DEVILBISS COMPANY assembled all its district sales managers and field engineers from coast to coast recently at the main plant in Toledo. The conference was called to review the 1951 sales program and determine what further steps could be taken to achieve the greatest degree of standardization in engineering, manufacturing and sales of products.

Since 1888 the company has pioneered in the manufacture of devices for putting air to work. The DeVilbiss line includes spray finishing equipment, air compressors, exhaust systems, and hose and connections.

Seventeen companies, representing a major segment of the country's manufacturers of porcelain-enameled steel products, cooperatively have undertaken a research program at **BATTELLE MEMORIAL INSTITUTE,** Columbus, Ohio, to establish the fundamental mechanics of adherence of ceramic coatings to steel.

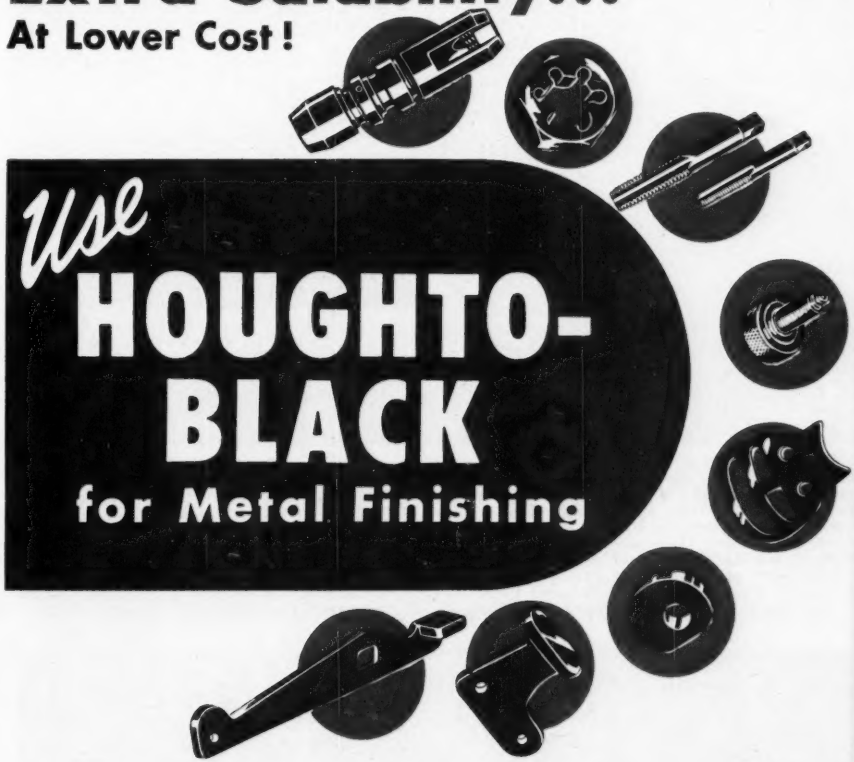
The problem, according to Battelle Director Clyde Williams, is to provide a scientific basis to pave the way for improved porcelain enamels for such products as refrigerators, ranges, kitchen cabinets, stoves, and other enameled products. Another objective is to provide fundamental information leading to the development of decorative and protective ceramic coatings prepared from nonstrategic materials.

The companies sponsoring the research include: American Stove Company, St. Louis, Missouri; Benjamin Electric Manufacturing Company, Des Plaines, Illinois; Borg-Warner Corporation, Chicago, Illinois; Chicago Vitreous Enamel Product Company, Cicero, Illinois; Climax Molybdenum Company, New York, New York; Ferro Enamel Corporation, Cleveland, Ohio; Florence Stove Company, Chicago, Illinois; Frigidaire Division of General Motors Corporation, Dayton, Ohio; The O. Hommel Company,

Give Your Metal Products

Extra Salability...

At Lower Cost!



Use HOUGHTO-BLACK for Metal Finishing

- Durable, uniform finish for metals and alloys
- Low in cost, fast and easy to use
- Won't alter dimensions of close-tolerance parts
- Simple one-bath process
- Rust-resistant—assures extra salability

WRITE FOR NEW BULLETIN

Don't wait for costly critical plating materials. Switch to attractive, inexpensive HOUGHTO-BLACK. Apply it to mass production without special equipment! Coat parts made of different steels uniformly even though they're made at different times! Get full information on the simple one-bath HOUGHTO-BLACK process from E. F. Houghton & Co., Philadelphia 33, Pa.

HOUGHTO-BLACK
. . . a product of

E F HOUGHTON & CO.
PHILADELPHIA · CHICAGO · DETROIT · SAN FRANCISCO

Ready to give you on-the-job service . . .

Pittsburgh, Pennsylvania; Ingram-Richardson Manufacturing Company, Frankfort, Indiana; International Nickel Company, Inc., New York, New York; Nash-Kelvinator Corporation, Grand Rapids, Michigan; Pemco Corporation, Baltimore, Maryland; The Pfaudler Company, Rochester, New York; A. O. Smith Corporation, Milwaukee, Wisconsin; Tappan Stove Company, Mansfield, Ohio; and Vitreco Inc., Youngstown, Ohio. It is expected that other firms may be added to the sponsor list.

According to Dr. Williams, the work is specifically directed toward: (1) Determining and evaluating the factors which contribute to adherence. (2) Determining the fundamental physical and chemical basis of adherence.

The laboratory investigations at Battelle are under the supervision of Dr. C. H. Harman and are being coordinated by L. S. O'Bannon. Cooperating scientists include Dr. B. W. King, H. F. Reid, H. E. Elsea, F. L. Shubert, and G. K. Manning.

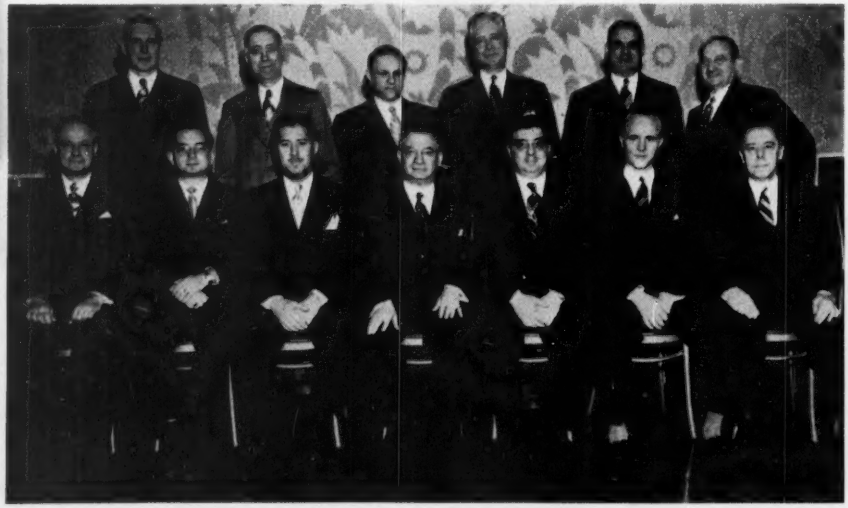
Newark's oldest lacquer manufacturer, **MAAS & WALDSTEIN COMPANY**, started its fourth quarter century of pioneering in the field of industrial finishes with a national sales meeting and a 75th Anniversary Dinner at the Essex House in Newark, January 6 and 7, attended by company representatives from coast to coast, officials, and their guests.

Maas & Waldstein's main plant and executive offices are on the same Newark site where it was originally located in 1876. After 75 years of continuous growth and development, the company has plants in Chicago and Los Angeles, and sales and engineering offices in 25 cities from coast to coast.

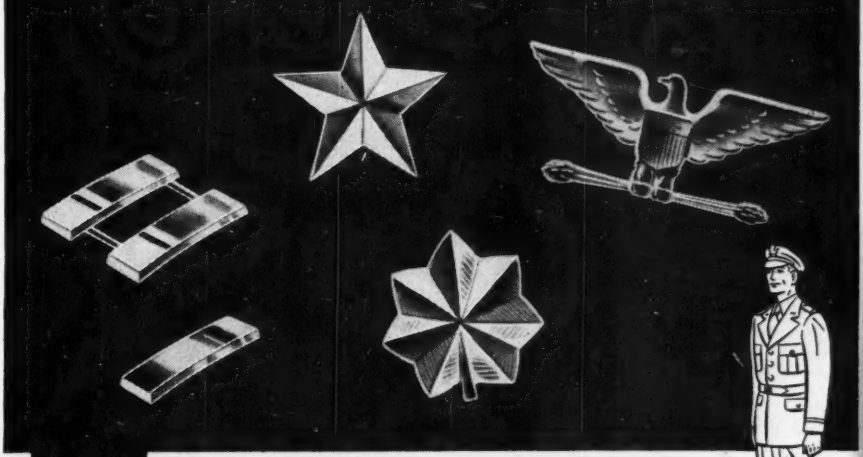
NEW POSITIONS

WALLACE B. PHILLIPS has been elected president of the Pyrene Manufacturing Co., Newark N. J. He succeeds **EDWARD J. WARING**, who, upon his retirement in August 1950, had served the

Some of the Maas & Waldstein executives, suppliers, and guests who attended the 75th Anniversary Dinner at the Essex House, Newark, on January 7. (Left to right, front row): Franklin Fader, president, Franklin Fader Company; M. S. Kaye, plant engineer, M&W; B. F. Ames, general sales manager; Dr. Gustave Klinkenstein, president; R. F. Magnus, treasurer; Gustave Weidenmeyer, vice president, National Newark and Essex Banking Company; Irving Gumb, executive vice president, New Jersey Chamber of Commerce. (Back row): Casper Apple, resident vice president, Haskins & Sells; J. B. Weisel, assistant to the general manager, Hercules Powder Company; M. H. Corbin, vice president, New York Paint, Varnish & Lacquer Association; E. E. Hoffman, director, Industrial Finishes Division, National Paint, Varnish & Lacquer Association; D. H. Litter, president, D. H. Litter Company; M. Flaumenhoft, president, C. J. Osborne Company.



it's the SHAPE that counts



. . . in BURNISHING MATERIALS too.

Military insignia, brass buttons and cap ornaments often acquire their bright, smooth finish from ABBOTT Burnishing Materials. They're shaped to do the job right.

Abbott Burnishing Shapes — Ball, Ovalball, Cone, Diagonal, Pin — are scientifically designed to make effective contact on metal stampings and castings of any size or shape. Each is made from high quality, Abbott bearing ball steel, deep hardened and polished to a mirrorlike, glass hard finish. For quality burnishing . . . use Abbott.

WRITE for your copy of the informative Abbott Catalog-Manual.

THE ABBOTT BALL COMPANY
1064 New Britain Ave.
Hartford 10, Conn., U.S.A.

ABBOTT
the all round ball

There's MONEY FOR YOU

in HOFF-CRAFTER BASKETS

Yes, buying direct from the industry's leading manufacturer of all-welded cleaning baskets and racks will mean a big saving for you. The faster delivery we give; the longer life of welded construction; the many special cost-free services we offer—all put you far ahead dollar-wise when you use Hoffman baskets and racks.

Write today...

On replacement baskets, standard type or special design, we'll give you a quotation you're sure to like.

IN YOUR machine it's 10 to 1 the baskets were made by—

HOFFMAN COMPANY
YORK · PENNA.

company for almost 40 years as treasurer, vice president, and president.

Mr. Phillips has been a member of the Pyrene organization since 1913, and his activities in many fields have given him international repute. Through his cooperation in the activities of the U. S. Chamber of Commerce, National Association of Manufacturers, U. S. Council of the International Chamber of Commerce, National Foreign Trade Council, and the Council on Foreign Relations, Mr. Phillips has received in the United States, in Canada, and in other countries marked recognition as a leader of men and a director of affairs.

W. I. Tebo

W. I. TEBO has been appointed Washington engineering consultant and technical advisor for Detrex Corp., Detroit 32, Mich., according to an announcement by A. O. Thalacker, vice president and general manager.

To his new position Mr. Tebo brings vast experience in basic engineering research. During his 19 years of company service he has had laboratory, engineering, and field experience in every phase of industrial metal cleaning.

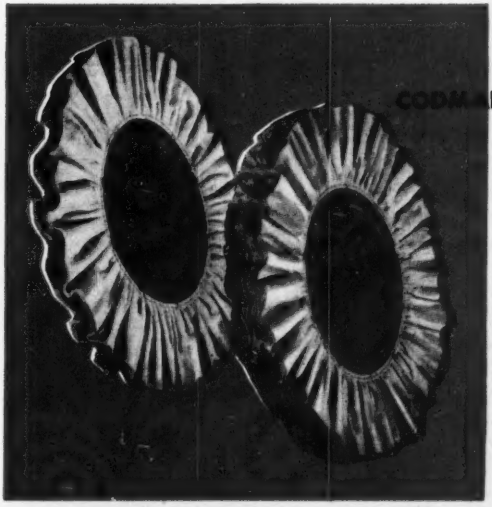
Having recently returned from a special assignment in foreign countries, he will now make his headquarters at the Shoreham Hotel in Washington, D. C.

Max C. Jones, president of Michigan Abrasive Company, Detroit, has announced the promotion of **C. H. WILLIS** from general sales manager, in which capacity he has served for a number of years, to director of sales.

In addition, Mr. Jones announced that **B. S. MEADE** has joined the firm as general sales manager. Mr. Meade was formerly vice president of the American Swiss File and Tool Company of Elizabeth, New Jersey.

CODMAN NON-FRAY VENTILATED BUFFS

Give You More...



...because

CODMAN *Ventilated* NON-FRAY BUFFS
are the most EFFICIENT
ECONOMICAL
HARDER WORKING
LONGER LASTING BUFFS
designed for every operation.

Codman Buffs are AIR-COOLED, engineered to provide maximum ventilation under most gruelling conditions regardless of speed and extent of operation.

CODMAN *Ventilated* NON-FRAY BUFFS cut down your production costs, and increase your profits.

CODMAN BUFFS *Give You More!*

BRANCH OFFICES
PHILADELPHIA DETROIT LOS ANGELES
INDIANAPOLIS GRAND RAPIDS

THE CODMAN NON-FRAY VENTILATED BUFFS ARE MADE UNDER PATENT NUMBERS 2,027,863 2,094,650, 1,573,961, RE. 19,894, 2,140,208 OTHER PATENTS PENDING

CODMAN
BRADLEY
ROCKLAND - MASSACHUSETTS

For Over 50 Years the Greatest Name in Buffs

Clyde Kelly

CLYDE KELLY, former vice president of Driscoll & Company, Chicago, has joined B. Mercil & Sons Plating Co., 1901-19 W. Fulton St., Chicago 12, Ill., as assistant to Edward W. Smith, president. The company is well known not only for its job plating facilities but also for the plating barrels and equipment which it supplies.

Mr. Kelly, long active in the National Association of Metal Finishers, as well as the American Electroplater's Society, is general chairman of the A.E.S. 1952 Convention and Industrial Finishing Exposition to be held in Chicago.

Specialloy, Inc., 36 W. 47th St., Chicago, Ill., announces the election of **MILTON SILVERSTEIN** as chairman of the board of directors.

Mr. Silverstein has resigned as president and director of Silverstein & Pinsof, Inc., Chicago.

John M. Cook

Behr - Manning Corporation has announced the election of **JOHN M. COOK,** former general sales manager, to the position of vice president. Mr. Cook also was named general manager of the abrasive division.

He began his career in the sales department of the company in 1921 and was made sales manager of general trades in 1948. He was named to the board of directors in January 1949 and last year was made assistant general manager of the abrasive division.

ELMER C. SCHACHT was reelected president of the company.

PAUL F. PIE', JR., has been appointed superintendent of the Marshall, Texas activated carbon plant of the Darco Department, Atlas Powder Company, according to an announcement by L. M. Gill, general manager. Mr. Pie' succeeds **RICHARD M. WILLIAMS,** who retired March 1.

Mr. Pie' joined Atlas Powder Company in 1932 after graduating in chemical engineering from the University of Delaware. In 1942, following several years in the Darco Research Laboratory, he went to Kentucky Ordnance Works, a TNT operation managed for the U. S. Government by Atlas. He returned to Marshall in 1945 as assistant superintendent.

Mr. Williams went to Marshall as engineer on construction when the plant was started in 1921, later becoming assistant superintendent and superintendent. He started with Atlas at its Perryville, Maryland war plant in 1918.

Maurice D. O'Leary

MAURICE D. O'LEARY, who has been works manager and assistant to the vice president of Chicago Vitreous Enamel Product Company since December 1947, has been elected a vice president, according to an anouncement by William Hogenson, president.

Joining the company in 1927, Mr. O'Leary was in charge of general stores, and in 1928 was appointed to the purchasing department. He became head of this department in 1929 and was given the additional responsibility of office management in 1939.

TRAINING COURSES

THE BINKS MANUFACTURING CO., 3118-40 Carroll Ave., Chicago 12, Ill., announces schedules through June for its Spray Painting School. New classes will be held Monday through Friday, March 5 to 9, April 2 to 6, May 7 to 11, and June 4 to 8.

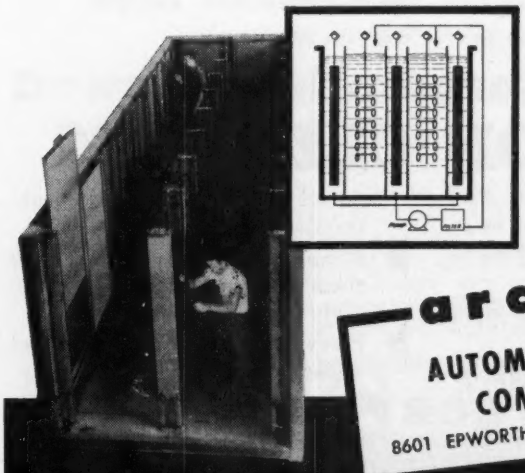
To assure attention to individual prob-

SLIPPAGE!

Every day it becomes more important that plating rejects be brought under control

DIAPHRAGM PLATING ASSURES A NEAR PERFECT FINISH—CONSERVES METAL AND REDUCES COSTS

Diaphragm systems now in operation have reduced plating costs and minimized loss of hard-to-get materials due to slippage through rejects . . . Diaphragming permits the segregation of anolyte and catholyte to remove by filtering, organic and metallic insoluables that normally deposit themselves on the work piece causing roughness and corrosion areas in the plate.



Our engineers have worked closely with the leading plating engineers who have made Diaphragming practical. We are glad to offer you the benefit of our speicialzed knowledge and experience in this field in planning a new installation or determining the feasibility of converting your existing equipment.

Write for our Literature on Diaphragming

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lems, classes are limited in size. Instruction is provided by Binks as a service to industry, with the express purpose of raising finishing standards and reducing costs. Classes are open to anyone wishing to attend.

For further information or reservations, E. F. Watts should be contacted at the above address.

THE JOSEPH B. KUSHNER ELECTROPLATING SCHOOL, Stroudsburg, Pa., announces that the **FULTON ASPHALT CO.,** 165 W. Wacker Dr., Chicago, Ill., has made available to all persons who are interested in advancing in the field of electroplating two scholarships in "Electroplating Know-How."

Fulton Asphalt Scholarship winners receive a complete one-year home study training course under the direct personal supervision of Joseph B. Kushner, well-known electroplating engineer. On completion of the course, a certificate is awarded by the school, which is licensed by the Pennsylvania Department of Public Education.

Any person having the equivalent of at least a grammar school education can apply for the scholarship by following the following rules:

1. At the top of a sheet of white 8½ x 11 paper, print name, address, present occupation, and company affiliation.
2. Fold over the top edge of the paper so that this information is not visible. Hold fold in place with a small piece of Scotch tape.
3. Starting above the center of the page, using ink or typewriting, complete with 50 words or less the following statement:
   "Electroplaters should be able to **think** plating as well as do plating because . . . . ."
4. Submit this statement by mail to Electroplating Scholarship Contest, Box 230, Stroudsburg, Pennsylvania.

The Scholarship is open effective immediately and ends midnight, **May 20, 1951.** Further information can be obtained by writing to the contest address given under Rule 4.

HONORS

The Baltimore-Washington Branch of the American Electroplaters' Society made **PRESIDENT WILLIAM J. NEILL** eligible for membership in the Order of The Pot by presenting a pot to him at the close of its January meeting. The presentation was made by Past President Kenneth M. Huston, a charter member.

Get Metal Parts CLEANER FASTER -- CHEAPER

SEND NOW FOR SAMPLE AND FULL DETAILS ON

PELRON Corporation's Newest EMULSION CLEANERS

- New principle of detergency. Partially emulsified soil floats away —does not remain in machine to re-deposit on work.
- Less material needed for more thorough cleaning.
- Longer usable life, greatly reduced concentration means substantial saving.
- Blend of synthetic, surface-acting chemicals, non-corrosive, completely neutral, fast acting.
- Prevents rust for a number of weeks.

PELRON CORPORATION

FORMERLY CHEMCO PRODUCTS CO., INC.

7740 W. 47TH STREET, LYONS, ILLINOIS

Manufacturers of Industrial Chemicals

• **ROD TYPE ELECTRIC HEATERS** (with insulated sheath) for Long, Safe, Dependable Life. No glass. No flame. Adapted from furnace construction and the modern electric range.

• **4" INSULATED WALLS AND CONTROLLED AIR TEMPERATURES.** Standard with the oven industry.

• **DE-MOUNTABLE—STANDARD DIMENSION COMPONENTS:** Never obsolete. The accepted approach of modern design.

• **DRAW-OUT TYPE, DEAD-FRONT ELECTRICAL CONSTRUCTION.** Standard with the electrical industry.

• **COLOR BLIND** (long wave) **INFRARED** for fast, efficient product heating regardless of size, shape or color.

• **PROCESSED ALUMINUM HEAT DIRECTORS** for lifetime controlled energy densities. Used in the best illuminating equipment.

• **FULL COMPLIANCE WITH** National Board of Fire Underwriters **STANDARDS FOR CLASS A OVENS AND FURNACES.**

•**PLUS A HOST OF OTHER FEATURES.**

Ask the "Heating Consultant" of your electric power company for advice on Jensen Panel Heat, or write for bulletin with convenient specification form. Recommendations on heating applications (150° to 650° F.) or complete processing systems gladly submitted. Representatives in principal cities.

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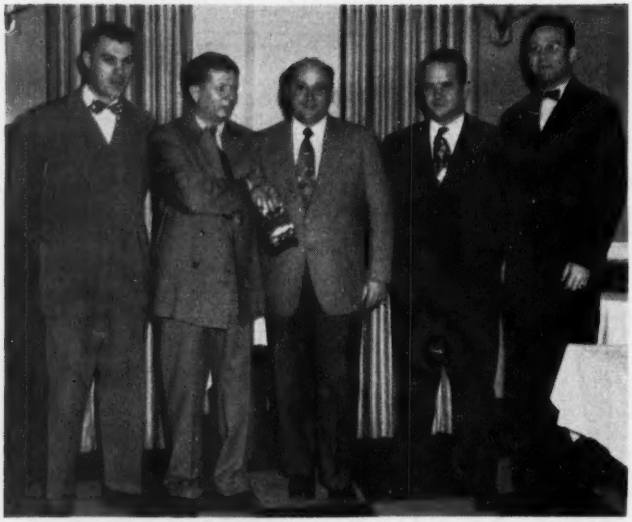


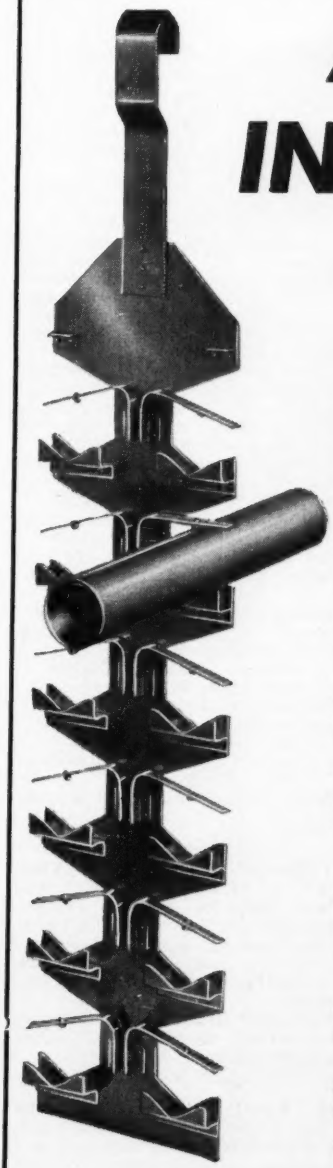
Members of the Baltimore - Washington Branch, A.E.S., who arranged for presentation of a pot to President William J. Neill: (left to right) Josh Hughes, librarian; President Neill; William Bresnik, treasurer; Ray Stricklen, Branch president; and George Best, secretary, and editor of "Baltimore-Washington Bali-Wick."

In his remarks prior to the presentation, Mr. Huston explained that the Order of The Pot was organized by Past President Pinner after the Law Committee (consisting of past presidents) was deactivated by the new constitution. The objects of the Order are: (1) to bind the past presidents of the Society into a group for the furtherance of the aims of the Society; (2) to promote good fellowship among those who have given the time essential to operate the functions of the Society; and (3) to provide a group of experienced leaders to whom the Executive Board of the Society may refer problems of organization, policy, or finance.

In recognition of their years of service with Maas & Waldstein Co., Newark, N. J., manufacturer of lacquers, synthetics, and enamels, Dr. G. Klinkenstein, president, welcomed four new members to the company's 25-Year Club at its 75th Anniversary dinner celebration in January.

CONRAD FREY, who has been with M & W for 50 years, received a diamond ring and a 50-year pin. Gold wrist watches and 25-year pins were given to **ARTHUR FELT, JOE DADDARIO, N. J. A. GUARDA,** and **C. BAILEY.**

Robert Magnus, treasurer (left), and Dr. G. Klinkenstein, president (right), hold the plaques of appreciation presented to them by all Maas & Waldstein employees. James Dowd, purchasing agent (center), made the presentation, assisted by J. M. Coyne, C. F. Rohleder, and A. Caprio, representing sales, laboratory, and manufacturing respectively.



AIR DRY INSULATION

Anodizing Racks Fixtures

New air drying insulation for aluminum racks and fixtures used in anodizing and chemical treatments will prevent destruction of costly racks and stop useless waste of current.

BUNATOL No. 796 is a high gloss black insulation of good body that can be applied by dipping, brushing or spraying. Formulated to resist acid solutions as used in anodizing operations. Excellent adhesion. Just a few coats provide a tough insulation that will resist abrasion and shop abuse. A low cost insulation operation which can be handled in any shop without use of an oven for baking.

STOP OFF A new quick air drying lacquer for use on aluminum to stop off anodizing. Dries fast and holds the edge. Just peel off to remove. A time and labor saver for selective anodizing.

Just a note on your letterhead will bring complete information on these interesting new BUNATOL products.

Nelson J. Quinn Company

TOLEDO 7 • OHIO

Conrad Frey is shown being congratulated by Dr. G. Klinkenstein, president, on his 50 years of service.

A feature of the meeting was the presentation to Dr. Klinkenstein and Robert Magnus, treasurer, of bronze plaques of appreciation from all the Maas & Waldstein employees.

SOCIETIES

The 1951 **CONVENTION** of the **AMERICAN ELECTROPLATERS' SOCIETY** will be held July 30 to August 2 at the Statler Hotel in Buffalo, New York.

At the Executive Board meeting in Chicago on January 26, the holding of a Convention in Los Angeles was postponed indefinitely. Both the Executive Board and the Los Angeles Branch had for some time given this matter a great deal of thought. Both, independently, reached the conclusion that it would not be in the best interest of the Society to hold the Convention in Los Angeles this year, in view of the national emergency and its effect on the plating industry.

The dual problem then arose of finding, quickly, a Branch which would be willing and enthusiastic to organize a Convention within the available time and to run it, in a convention city which could satisfy the requirements for hotel space.

Fortunately, suitable hotel space was found in Buffalo, New York, in Statler Hotel, on July 30-August 2, and the Buffalo Branch obliged the Society by voting unanimously to become the Host Branch. Whereas the available date is later than usual, it appears to be a happy compromise, because it is said that nights are always cool in Buffalo in the summer, and there are many attractions for summer vacationists in the vicinity of the city.

At a special meeting of representatives of the Buffalo Branch on February 10, a preliminary report of the technical program as prepared by the Editorial Board was presented by the Executive Secretary, and plans were discussed for the entertainment programs for both men and women.

The following Convention Committee Chairmen were appointed, who immediately began to organize their respective committees and activities:

General Chairman — Bert Kirchoff
Co-Chairman—Dr. C. J. Wernlund
Co-Chairman—W. M. Fotheringham
Educational Chairman—Stanley Bush
Registration Chairman—Wm. D. Hart
Hotel Reservation Chairman—B. P. Fortin, Jr.
Program Chairman—H. A. Fudeman
Entertainment Co-Chairmen — Joseph Ruff and J. Moneypenny.
Publicity Chairman—Joan T. Wiarda
Banquet Chairman—J. Moneypenny
House Chairman—Anthony Nigro
Outing Chairman—Joseph Ruff
Ladies Chairman—Mrs. Alice Nigro
Reception Chairman—W. M. Fotheringham
Transportation Chairman — Leon A. Nowak

The **PITTSBURGH BRANCH OF THE AMERICAN ELECTROPLATERS' SOCIETY** will hold its Annual Ladies' Night Banquet and Dance in the Hotel Sheraton Ballroom on April 14. The committee, under the chairmanship of Ken Carpenter, promises excellent food and entertainment.

The Pittsburgh Branch will welcome the presence of members of other Branches at this affair.

The **ST. LOUIS BRANCH** of the **AMERICAN ELECTROPLATERS' SOCIETY** is holding a Spring Banquet at 7 p.m. on April 21, at the Starlight Roof of the Hotel Chase, St. Louis. There will be

Distinctive finishes prepared by our Creative Studio are interesting, refreshing, and practical. They have attention arresting characteristics . . . sales appeal. Our skilled staff of artists conscientiously incorporate their experience and know-how to produce coatings that do a real selling job. We suggest that you avail yourself of their creative abilities. • Reputable firms are invited to send samples to be finished . . . no cost or obligation whatever.

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Manufacturers of Protective and Decorative Coatings

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GORDON BARTELS CO.
Roller Coating Specialists

no educational session in the afternoon.

Tickets at $5.00 per person can be obtained from Arthur P. Wrisberg, 2818 LaSalle St., St. Louis 4, Missouri.

Members of the **SAINT LOUIS BRANCH** of the **AMERICAN ELECTROPLATERS' SOCIETY** were treated to an entirely different type of meeting in January than had ever been held before by the group. More than 100 members and guests toured the new modern plant of American Fixture & Manufacturing Company instead of holding forth at the York Hotel as has been the custom for over seven years.

Robert Coulson, plating foreman for American Fixture, tendered the invitation for the tour to his fellow members. With the cooperation of John Nash, manager of the Korrect-Way Division of the firm, and Irvin Keefer, manager of Chrome-Craft Division, Mr. Coulson planned the meeting. Following the tour, dinner was served in the plant cafeteria.

Highlight of the tour was the showing of two huge Udylite Full-Automatic Plating Machines, each capable of plating a complete dinette set every 45 seconds. In addition, the many products made by the company were displayed. The group included all of the Branch officials: Bruce Robert, president; Fred Stark, Homer Schwartzel, and John Vogt, board of managers; E. H. Hunleth, secretary-treasurer; A. Julius, vice president; and Kenneth Robins, librarian.

The **39th ANNUAL EDUCATIONAL SESSION** of the **CHICAGO BRANCH, AMERICAN ELECTROPLATERS' SOCIETY,** was held Saturday, January 27, at the Stevens Hotel. The educational program was arranged as a symposium on the subject, "The Preparation of Metals for Plating."

The 1952 **CONVENTION COMMITTEE** and the **EXECUTIVE COMMITTEE** of the **AMERICAN ELECTROPLATERS' SOCIETY** met at the Stevens Hotel in Chicago on January 27, 1951. The meeting was held in conjunction with the Annual Educational Meeting and Banquet of the Chicago Branch of the American Electroplaters' Society. Those present were: (reading clockwise) Art Bartman, Chicago Branch; Rudy Hazucha, Chicago Branch; Klem Petrosius, Chicago; Dr. J. H Monaweck, president, Chicago Branch; Richard J. Wooley, Los Angeles Branch; Dr. George P. Swift, third vice president, Supreme Society, Boston; C. F. Nixon, first vice president, Supreme Society, Detroit; Marion Longfield, co-chairman, 1952 Convention; Paul Glab, secretary, Chicago Branch; Franklyn MacStoker, second vice president, Supreme Society, New York; Clyde Kelly, general chairman, 1952 Convention, Chicago Branch; William J. Neill, president, Supreme Society, Columbus, Ohio; Harold Smallman, Western manager, Hanson-Van Winkle-Munning Company; J. M. Andrus, librarian, Chicago Branch; A. K. Graham, executive seretary; Henry Bornitske, Milwaukee Branch; H. A. Gilbertson, former president, Supreme Society, Chicago; Leonard Weeg, Rockford Branch; William Geissman, Rockford Branch; Dr. H. J. Weisner, St. Joseph Valley Branch; Harold W. Faint, Chicago Branch; Ray F. Ledford, publicity chairman, 1952 Convention.

You WILL BE IN GOOD COMPANY when YOU USE...

SURPHOS

Metal Phosphating Chemical

Currently Used On:

Sheet Steel, Machined and Cast Iron . . . Truck Hoods and Fenders . . . Auto Accessories . . . Tractors and Accessories . . . Clothes Washers . . . Stoves . . . Dish Washers . . . Hot Water Heaters Jackets . . . Air Conditioning Cabinets . . . Gas and Oil Space Heaters . . . Outboard Motors . . . Toys . . . Agriculture Implements . . . Lighting Fixtures . . . Diesel Locomotives . . . Many other items.

TO USE SURPHOS:

. . . dissolve in hot water to a concentration of one ounce per gallon and apply to metal by dipping or spraying in a power washing machine. Acid proof equipment not needed.

SURPHOS *Conditions Metal For Painting:*

- **CLEANS**
- **FORMS PHOSPHATE COATING**
- **PREVENTS RUSTING**
- **IMPROVES ADHESION of PAINT**
- **INCREASES HUMIDITY and SALT-SPRAY**
- **RESISTANCE OF PAINT**

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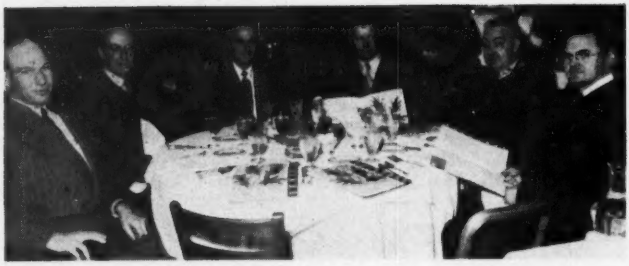

Fig. 1—Assembled for the Speakers' Luncheon are, left to right, Dr. Cloyd A. Snavely, Battelle Memorial Institute; Dr. K. G. Soderberg, editor, "Plating"; C. F. Nixon, Ternstedt Division, GMC; J. M. Andrus, librarian, Chicago Branch; Dr. Foster Dee Snell, Foster D. Snell, Inc.; Dr. J. H. Monaweck, president, Chicago Branch.

The first speaker, Dr. Cloyd A. Snavely, Battelle Memorial Institute, Columbus, Ohio, discussed pickling and bright dipping, and presented illustrative data and diagrams by means of slides. His talk covered the usual grades of steel, stainless steel, and non-ferrous metals. Theories on scale removal in acid were presented, and the superiority of muriatic acid to sulfuric acid for the pickling of steel was pointed out.

Dr. Snavely stated that the interest in the electrolytic pickling of steel, either with direct, reverse, or alternating current, had subsided to a great degree, although some electrolytic pickling of stainless steel was being carried out.

Mr. C. F. Nixon, A.E.S. first vice president and head of Process Development for Ternstedt Division, GMC, discussed polishing and buffing. His excellent presentation, accompanied by a great number of slides, reviewed mechanical methods of polishing and buffing, and presented data on buffing and polishing wheel speeds or surface speeds shown to be correct as a result of Ternstedt research.

Mr. Nixon showed that the trend in finishing is toward a better polished surface and less buffing of the plate. Generally, lower speeds for buffing have been shown to be beneficial.

Mr. Nixon's talk also covered Ternstedt mechanical polishing devices developed to prepare zinc base die castings for plating. The method involves rotation of the die castings in an abrasive slurry from which they emerge ready for plating, all hand polishing and buffing having been eliminated. The most recent development along this line has been named Gyrofinishing, and the machine designed and built for the purpose is called the Gyrofinisher. Die castings to be polished on this machine are mounted on fixtures which are suspended mechanically in the abrasive slurry, which is made to rotate around the castings rather than the castings rotating through the slurry. By means of this procedure it is reported that a finish suitable for plating can be obtained in one minute or less. As can be anticipated, the power requirements for this machine are considerable, but the savings which result more than offset the additional power cost.

Dr. Foster Dee Snell of Foster D. Snell, Inc., New York, presented a paper on "Alkali, Solvent, and Emulsion Clean-

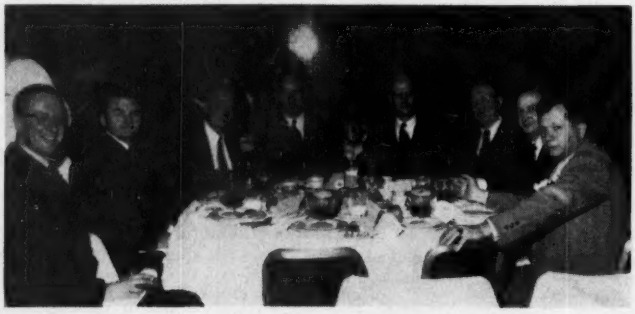

Fig. 2—This group of A.E.S. officers, photographed during the banquet following the 39th Annual Educational Session of the Chicago Branch, A.E.S., included, left to right, Dr. K. G. Soderberg; Dr. J. H. Monaweck; Dr. Foster Dee Snell; Dr. Cloyd A. Snavely; Dr. Geo. P. Swift, third vice president, A.E.S.; Franklyn J. MacStoker, second vice president, A.E.S.; C. F. Nixon, first vice president, A.E.S.; and William J. Neill, A.E.S. president.

UNDERCOVER AGENT!

Both steel boxes were top-coated with the same high-grade enamel; both had been cleaned thoroughly before finishing . . . but one had been primed with STANTITE. Then both were subjected to a salt spray under laboratory test conditions: after 93 hours the first box showed 75% rust failure—but the STANTITE-primed box showed no film failure after 500 hours!

Besides preventing corrosion and rust creep STANTITE Spraying Primer and STANTITE Clear Primer (for dipping) provide excellent adhesion to all types of surfaces . . . may be used with most types of top coats. Created for application under air-dried or baked finishes, STANTITE dries rapidly, is unimpaired by any baking schedules.

Find out now what STANTITE can do for your product . . . for complete information write today to the Stanley Chemical Company, East Berlin, Conn.

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Industrial Coatings

STANLEY CHEMICAL

LACQUERS · SYNTHETICS · JAPANS · ENAMELS

Fig. 3—This group of officers and prominent members of the National Association of Metal Finishers enjoyed the festivities at the recent Chicago Branch, A.E.S., Annual Meeting and Banquet.

(Photos by PRODUCTS FINISHING)

ing," reviewing briefly the various kinds of synthetic detergents.

Dr. Snell discussed what might be called the chemical mechanics of many cleaning processes, pointing out the general principles involved in the removal of undesirable substances from metal surfaces. One point which he made was that the plating industry can adopt with profit results of researches in other industries, and apply the same general principles to the solution of plating problems.

At the end of the formal presentation of the papers, the speakers assembled and answered questions from the floor as well as written questions submitted by the audience. The number of questions submitted indicated clearly the interest of the listeners in the subjects discussed, and demonstrated that the Program Committee had chosen wisely in selecting the papers to be presented.

Approximately 1100 persons were present for an excellent dinner and entertainment program presented in the evening. As may be imagined from the accompanying photographs, all those present had an enjoyable time.

The Chicago Branch committee, under the leadership of Chairman Harold Smallman, is certainly to be congratulated for the success of the meeting.

NECROLOGY

DR. CARL E. HEUSSNER, a leader in the electroplating industry, died January 2, in Detroit. He was 51 years old.

Dr. Heussner was formerly director of Materials Testing Laboratories, Engineering Div., Chrysler Corp., with whom he had been associated for 22 years.

Long active in the American Electroplaters' Society, Dr. Heussner was the author of many articles on plating. His personal contributions to the science of plating includes many new plating and testing techniques. His plating developments for use in connection with the atomic bomb are most notable.

YELLOTT F. HARDCASTLE, a director of the Pennsylvania Salt Manufacturing Company, died February 4 at the age of 67.

ROBERT CROOKS STANLEY, chairman of board of directors of The International Nickel Company of Canada, Ltd., died February 12 at the age of 74.

A leading mining engineer and metallurgist, Mr. Stanley was graduated in 1899 from Stevens Institute of Techno-

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Guaranteed 100% Pure Gold Content
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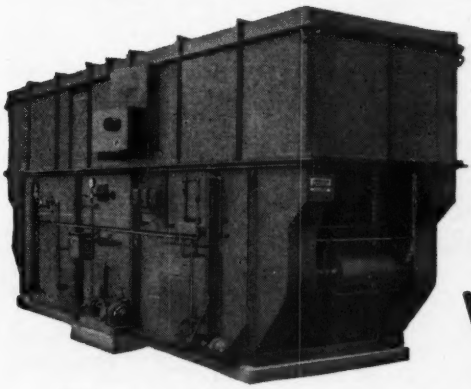

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You can save *dollars* on your cleaning operations by installing an OPTIMUS Vapor Degreaser in your production line. With its use metal parts cleaning is speeded up and made more efficient. Grease, oil and dirt are quickly and effectively removed from the parts by the vapors of the solvent. Chips, insoluble impurities, buffing compounds and stubborn dirt are completely removed with clean solvent flushing. Maintenance and operation costs are at a minimum. Solvent is distilled and reclaimed *automatically*.

TRICHLORETHYLENE and PERCHLORETHYLENE
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OPTIMUS VAPOR DEGREASERS available in all types, vapor, vapor-immersion, vapor-spray and combinations. All sizes from small batch-type degreasers to custom-built monorail or cross-rod conveyor models.

WRITE FOR—*complete catalog, or submit your metal cleaning problem, without obligation, for our study and recommendation.*

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MANUFACTURERS OF
VAPOR DEGREASERS, WASHING, RINSING, PICKLING & DRYING EQUIPMENT FOR METAL PARTS

logy, and from the Columbia University School of Mines two years later. In 1901 he joined International Nickel, serving as general superintendent from 1914 to 1918 and as first vice president for the next four years. Mr. Stanley had been president since 1922, a post he relinquished last year.

Mr. Stanley provided the leadership that resulted in the company's vast growth after the first World War. Today the organization produces 75 per cent of the world's nickel.

He was a member of the American Institute of Mining and Metallurgical Engineers, American Iron and Steel Institute, American Mining Congress, the Mining and Metallurgical Society of America, the Institute of Metals in London, the Canadian Institute of Mining and Metallurgy, and the Copper Development Association in London.

RUSSELL L. PECK, refractories engineer for Norton Company, was killed in an automobile accident in Tallulah, La., on January 23. Mr. Peck was a native of Stratford, Conn. Prior to joining Norton Company in 1945, he had been a refractories engineer for several concerns in the East.

BOOTHCOTE

cleans spray booths quickly, economically, safely!

Spray Boothcote on clean booth. Surplus paint can then be peeled off in sheets by any operator.

- Saves time and labor
- Time-tested; used for 14 years
- Mixed—ready to use
- Can be brushed or sprayed
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Money back trial offers: 5 gals. $6.25 f.o.b. Buffalo or write for Circular.

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meetings

OF INTEREST TO FINISHERS

Mar. 13-16. 1951 Conference and Exhibition, National Association of Corrosion Engineers, Statler Hotel, New York, New York.

Mar. 19-23. Seventh Western Metal Congress and Exposition, Civic Auditorium and Exposition Hall, Oakland, California.

Mar. 21-22. 16th Annual Meeting, American Hot Dip Galvanizers Association, Inc., Biltmore Hotel, Atlanta, Georgia.

Mar. 31. Annual Educational Meeting and Dinner, Rockford Branch, A.E.S., Faust Hotel, Rockford, Illinois.

Apr. 7. Annual Technical Session and Banquet, Boston Branch, A.E.S., Hotel Statler, Boston, Massachusetts.

Apr. 8-12. 99th Meeting, The Electrochemical Society, Wardman Park Hotel, Washington, D. C.

Apr. 14. Annual Ladies' Night Banquet and Dance, Pittsburgh Branch, A.E.S., Hotel Sheraton Ballroom, Pittsburgh, Pennsylvania.

Apr. 21. Spring Banquet, St. Louis Branch, A.E.S., Starlight Roof, Hotel Chase, St. Louis, Missouri.

Apr. 25-26. Seventh Annual Meeting of the Metal Powder Association and Metal Powder Show, Hotel Cleveland, Cleveland, Ohio.

Apr. 28. Annual Meeting and Banquet, Milwaukee Branch, A.E.S., Schroeder Hotel, Milwaukee, Wisconsin.

Apr. 28. 12th Annual New England Regional Meeting, A.E.S., Hotel Taft, New Haven, Connecticut.

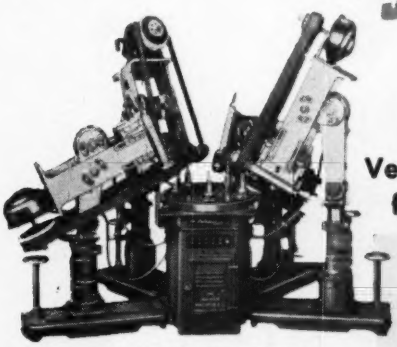
June 18-22. Annual Meeting, American Society for Testing Materials, Atlantic City, New Jersey.

July 30-Aug. 2. 38th Annual Convention, American Electroplaters' Society, Statler Hotel, Buffalo, New York.

Oct. 29-31. 63rd Annual Convention, National Paint, Varnish and Lacquer Association, Chalfonte-Haddon Hall, Atlantic City, New Jersey.

Nov. 1-3. 29th Annual Meeting, Federation of Paint and Varnish Production Clubs, Chalfonte-Haddon Hall, Atlantic City, New Jersey.

THEY'LL EVEN DO YOUR SPECIALIZED JOBS!



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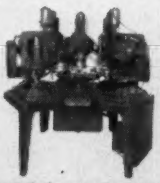
The #4-5 Rotary Indexing Packer-Matic equipped with abrasive belt heads. Uses buffs, polishing, tampico, wire wheels or belts.

For DOUBLE Efficiency . . .
Versatile STANDARD Packer-Matics for routine jobs and "Specials"



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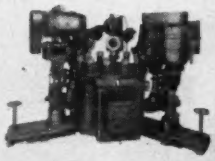

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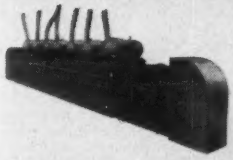

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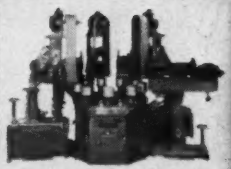

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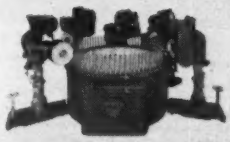
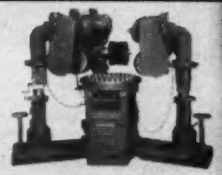


NO. 13 CONTINUOUS ROTARY



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Jobs you've always considered too specialized for an automatic machine are routine tasks for the versatile standard Packer-Matic. Silverware, household appliances, cosmetic accessories, hardware, plumbing supplies . . . regardless of shape, metal, or finish no job is too difficult.

Call on Packer-Matic engineers for information . . . and instruction in up-to-the-minute buffing techniques. Like the performance of our machines, the service of our engineers can help you add hours of efficient production to every working day.

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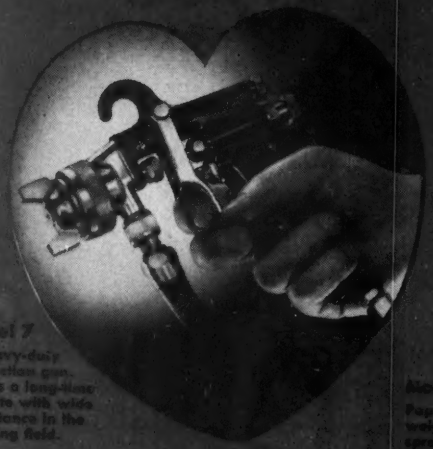

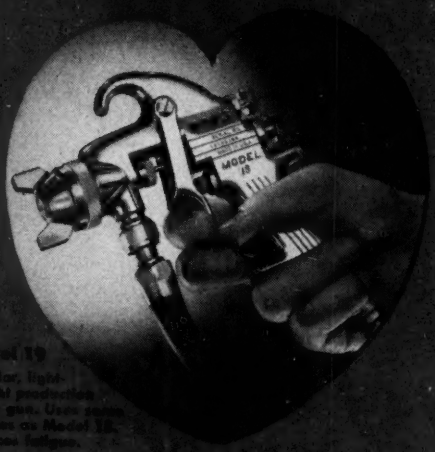

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Adjustable spray pattern, round to flat	√	√	√
Drop-forged aluminum body, black electrolytic coating	√	√	
Nickel-plated, aluminum body			√
Needle valve, hardened stainless steel	√		
Needle valve, hardened steel*		√	√
Material nozzles, hardened steel with tapered seat design	√	√	√
Air nozzle, gun head, drop-forged bronze, chromium-plated		√	
Air nozzle, Brass, nickel-plated	√		√
Air and material nozzles quickly changed	√	√	√
Air valve, removable cartridge-type	√	√	√
Two-finger trigger with hardened plate	√	√	√

hardened stainless steel needle valves are available for these guns.

heart of your finishing department

The quality of your product finishes depends upon the spray gun you use. Your spray gun is truly the heart of your finishing department. To insure the uniform, fine finishes demanded by the buying public, choose from the Binks "trio." These three favorites, part of the Binks full line, are setting the pace for better...faster finishing.

Look carefully at any Binks spray gun. Observe the precision workmanship...the engineering know-how evidenced in its efficient design. Wear-resistant materials are chosen for all vital parts, insuring long economical, trouble-free service. Try out one of these performance-tested guns. Note its fast, uniform coverage...its adjustable spray pattern...the convenient, back-of-gun location of its controls.

There is a Binks precision-made gun for every type of finish...a choice of 1,050 nozzle combinations. To be certain that you get exactly the right gun and nozzle, Binks engineers will gladly test your material in the Binks Research Laboratory.

Send now for free information on these guns.

"The goal of American ingenuity is the creation of better products at lower costs."

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President

Binks MANUFACTURING COMPANY

3118-40 Carroll Ave., Chicago 12, Ill.

NEW YORK • DETROIT • LOS ANGELES • ATLANTA • BOSTON • CLEVELAND • DALLAS • MILWAUKEE • NASHVILLE
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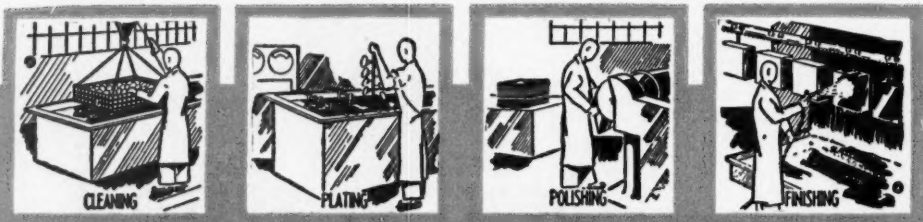


New • EQUIPMENT • MATERIALS • PROCESSES

High Speed Centerless Polishing Machine

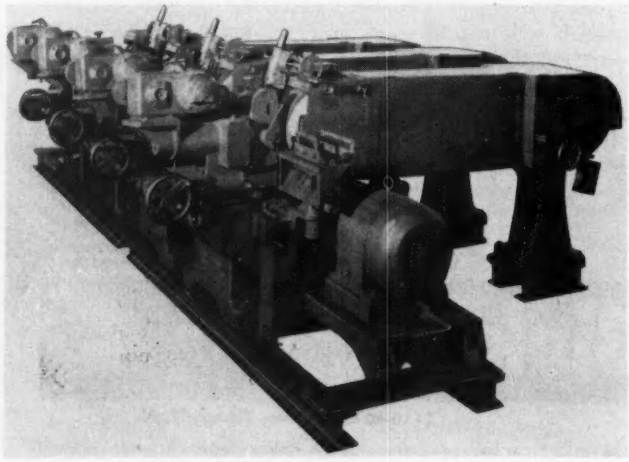
Production Machine Co., Greenfield, Mass., has developed its Type 101 High Speed Centerless Polishing and Buffing Machine employing the use of abrasive belts or polishing and buffing wheels.

Available for single or tandem arrangements, it is said to produce nearly any desired finish if a sufficient number of machines are used in the installation. While maintaining the same general design as the standard speed machine, Type 101 contains a completely new work feeding unit and motorized variable speed feed drive assembly. Simple adjustments within easy reach of the operator permit a range of feeding speeds up to 70 feet per minute.

Also included in the Type 101 is a larger wheel spindle with capacity for contact wheel or buffs up to 6 inches wide.

Reconditioning Service for Work Gloves

A work glove reconditioning service that by actual study is saving one large user over 80 per cent of all gloves sent in for salvage is now being offered on a national basis by the U. S. Industrial Glove Corp., 9350 Roselawn Ave., Detroit 4, Mich. In many instances workers are



Four Type 101 High Speed Centerless Polishing Machines arranged in tandem for use with abrasive belts and backstands on first three machines. The fourth machine is equipped with a buff for final operation. Adjustable roller fixtures are provided to support the work as it automatically passes from one machine through to the final buffing operation.

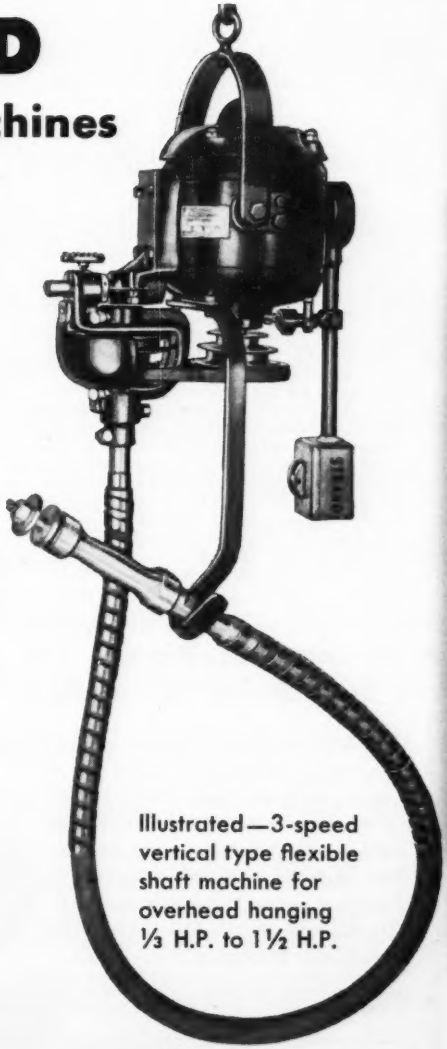
STRAND

flexible shaft machines *make work easier*

Complete line floor type...bench type... vertical for overhead hanging

STRAND flexible shaft machines are known for quality. Made sturdy to endure hard usage, they are time and work savers on many metal finishing jobs. Workmen find that their use is less tiring, for the heads are light but the power is ample . . . The result is more output and fine workmanship.

A complete line gives you a choice of styles to consider for your specific work. Write for catalog 31 for full specifications.



Illustrated—3-speed vertical type flexible shaft machine for overhead hanging ⅓ H.P. to 1½ H.P.

The Balmar Corporation
Woodberry, Baltimore 11, Md.
N. A. STRAND DIVISION
5001 N. Walcott,
Chicago 40

STRAND

Flexible Shafts and Flexible Shaft Machines

SALES OFFICES: CHICAGO, BALTIMORE and TULSA

said to prefer reconditioned gloves to new gloves because of their pliability and comfort.

The service, which the company points out is not ordinary industrial laundering, includes complete renovation, sanitizing, and packaging of all types of worn-out fabric and leather gloves and protective clothing.

Multi-Use Primer

The formulation of a rust-inhibiting primer which can be used for spraying or dipping applications has been announced by James B. Sipe and Co., Pittsburgh 16, Pennsylvania.

Designated as Multi-Use Primer, it can be used on nearly any clean ferrous or aluminum surface. It is basically a rust-inhibiting synthetic primer which reduces with toluol or xylol for spraying or dipping. The primer will either bake or air-dry with equal facility, according to the manufacturer, and it can be cured simultaneously with its top coat in a one-bake operation. A 15-minute baking operation at 300 deg. F. is said to be sufficient to thoroughly dry Multi-Use Primer. Ten minutes of air drying is adequate to allow handling.

Available in gray, red, yellow, and black, Multi-Use Primer is claimed to withstand severe exposure for over a year without showing any appreciable signs of corrosion.

Rossaul "Copper-Brite"

Known as "Copper-Brite," a safe, non-toxic, non-fuming bright dip for brass, copper, bronze, and nickel silver is available from the Rossaul Co., 170 Fifth Ave., New York 10, New York.

The solution removes most oxides and fire scale during a three-second dip. It will not etch, and leaves metal passive and resistant to further oxidation, the manufacturer states.

Claimed not to discolor silver solder, Copper-Brite is supplied in 1 and 5-gallon bottles and 13-gallon carboys.

Gardner Gage

The Gardner Gage, product of Henry A. Gardner Laboratory, Inc., 4723 Elm St., Bethesda 14, Md., has been designed for high precision measurements of the dry

A Strippable Plastic for the Protection of Metals

Striplastic is a protective plastic applied by spraying, dipping or rolling. It is used on stainless steels, high polished metal sheets, sheets in cold working or drawing, tools, dies and parts, and on sheets or metal parts before packaging. It protects against scratching and abrasion, and against rust. Also available as a booth coat protection.

THE STRIPLASTIC COMPANY
10828 QUEBEC AVE.
CLEVELAND 6, OHIO

Among many advantages, it is non-toxic, possesses great tensile strength and is easily stripped off in one piece. Write for complete information on this new strippable plastic.

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the job. There is a RANDOLPH FINISH for what-

Nitrate Dopes • Randolac SF for Metal • Plywood Sealer A-1

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How" into the surface you need to meet exact gov-

Synthetic Sealers • Randolph Colored Lacquers for Metal Series 220

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Acetate Butyrate Dopes • Undercoats S-G Primers • Infra Red S-

for products ranging from tractors and appliances

Dull Black Texture Enamels (Wrinkle) • Texture Enamels (Wrinkle)

to tanks and airplanes, RANDOLPH contributes

High Bake S-G White • High Bake S-G Colors • Metallic S-G Finishes

finishes of experienced-proved quality to today's

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expanding production effort. Get a RANDOLPH

Randolph Machine Tool Lacquers • Water-proofing Compositions

FINISH in any quantity — on time! ¶ Write us

S-G Silk Screen Paste • Series 112-Plastic Lacquers • Fabric Lacquer

today if you have any tough finishing problems.

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RANDOLPH
PRODUCTS COMPANY
CARLSTADT, NEW JERSEY

DOPES · LACQUERS · ENAMELS · THINNERS

thickness of non-electrical conductive coatings and other light materials.

The unit is self-contained, requiring no outside source of power. Ruggedly constructed, it is relatively small and light in weight, and is ideally suited for production control purposes. The body of the gage is fabricated from solid aluminum, and there are no delicate components to get out of order or require frequent adjustment.

Advantages of the Gardner Gage listed by the manufacturer include: (1) It can be used and is equally accurate in all positions; (2) measurements made can be considered as non-destructive for most purposes; (3) satisfactory results can be obtained by any operator after a few minutes of instruction; (4) since the gage is of the direct reading type, no conversion tables or charts are required; (5) several accurate readings each minute can be made; (6) results obtained with the unit are independent of the composition or thickness of the base on which the coating is being measured, and there are no limitations as to edge effect in making measurements on small laboratory panels. The only requirement is that the base on which the coating is applied must be electrically conductive. Plastic sheets and other sheet-like materials can be measured with the same ease and accuracy as attached coatings; (7) standard thickness shims are not required for setting the "zero" position of the gage. Any level metallic surface or the base block supplied with the device can be used; (8) readings can be made on curved surfaces as low as 5 inches in radius without introducing more than 0.10 mil error. Greater accuracy can be obtained and readings can be made on surfaces with even smaller radii of curvature by setting the zero of the gage on a bare surface of similar radius of curvature to that on which the measurement is to be made.

The manufacturer states that the gage also can be used on aluminum and other non-ferrous metals.

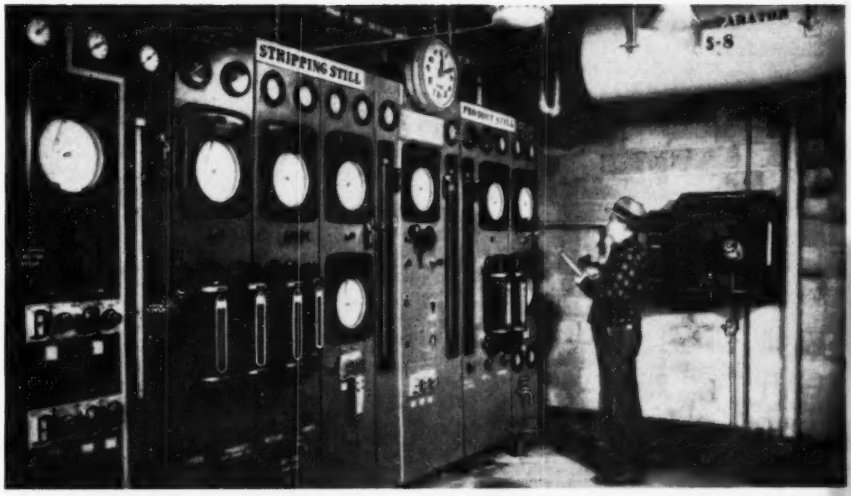
Gardner Gage

PURICO
WONDERBAR
Pre-Saponified
Composition
Cleans Better, Faster
Not just an ordinary buffing and polishing agent but a tested and highly effective composition that washes absolutely clean regardless of the type of work.
TRY WONDERBAR NOW! See how its quick action saves time and combats high labor cost.
Metal Cleaners — Plater's Supplies
Deodorants—Disinfectants
THE PURITAN MFG. CO.
WATERBURY, CONNECTICUT

Empire Black

An improved process for producing a black oxide finish for steel and iron known as Empire Black has been announced by Empire Solvents, Inc., 153 E. 26th St., New York 10, New York.

The process offers an operating range of from 280 to 300 deg. F., and is accomplished with one bath. According to the manufacturer, it utilizes less salts to make up the bath and in turn may be maintained by very small additions.



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NIALK TRICHLORethylene

Produced in a modern plant, NIALK* TRICHLORethylene is the modern answer to your metal-cleaning and degreasing problems. Rigid supervision of every stage of production protects its purity and uniformity.

A PAMPHLET containing information on properties and uses of NIALK TRICHLORethylene is available on request. Just send in coupon below.

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Gentlemen: Please send me a copy of your pamphlet on NIALK TRICHLORethylene.

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Chromium Plating Process

The Wire Coating & Manufacturing Co., 395 E. 131st St., Cleveland 8, Ohio, manufacturer of chemicals, additives, and brighteners for the electroplating field, has developed a process covering the electrodeposition of a bright decorative chrome plate over a zinc or cadmium plated base. This plating is applicable to zinc or magnesium base die castings, aluminum, and steel parts.

According to the manufacturer, the process offers advantages of reduction in nickel and copper metals, and widespread application in the war effort where protective finishes are required.

Adjustable Infra-Red Oven

An Adjustable Infra-Red Oven, ideally suited for drying of electroplated parts, baking of enamels, and drying of lacquers, has been announced by the Wil-Son Mfg. Co., Cloverport, Kentucky.

Available in 24, 32, and 48-inch long standard sections, the units can be joined tightly end to end to make one length of oven. The width is adjustable, and additional rows may be added at any time to increase the size. Each row is 8 inches wide. According to the company, the oven has instant adjustability, which permits the heat from each row of lamps to be accurately adjusted to most evenly bake the product. Each lamp row has a "Positive Lock Hinge Attachment" to the next lamp row, so that a six-row oven can be adjusted from a flat bank to a closed circle, in which the two end rows meet.

Wil-Son Straddle Oven Sections

The ovens are so constructed as to straddle mesh type conveyors or to permit trucks to be rolled in under the lamps, as well as for use over a table. Asbestos insulation panels provide a tight enclosure around the lamps to prevent heat loss. Side panels may be provided, as well as an adjustable table assembly attached to the vertical supports.

FOR SILVERSMITHS, PLATERS, JEWELRY MFGRS., ETC.

Supplied in brass, steel or nickel silver wire in sizes .0025 - .006 or bristle, Nylon or fibre.

Special sizes and shapes to order.

Write us (dep't. P) for catalog and price list.

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PLATERS RESEARCH
Control Systems
FOR THE ANALYSES OF PLATING SOLUTIONS
STANDARD ANALYTICAL REAGENTS
PLATERS RESEARCH CORP.
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"Paw sez ef VEDOC Defense Paint is good fer Army bombs an' rockets it should be jest right fer corn-squeezin's."

We don't go along with Paw's use of *Vedoc* Defense Paint here. But for Defense Contracts you have—or may get—our government specification finishes will fill the bill. Our World War II experience, combined with postwar research and increased facilities, enables us to offer you the best in Defense Paint. Your orders receive our prompt attention—whether they're for gallons or drums. Write today for samples and prices!

Remember, Ferro Is Set Up to Provide Complete Organic Coatings Service. From the Development of Diversified Protective Coatings—to the Designing and Installing of Efficient Finishing Oven Systems.

FERRO **ENAMEL CORPORATION**

LIQUID PLASTICS DIVISION

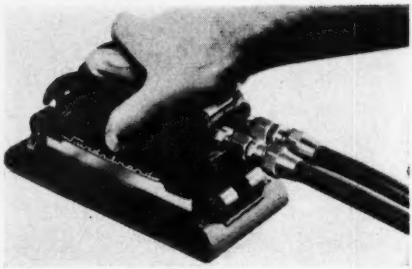
4150 East 56th Street • Cleveland 5, Ohio

Vedoc

Sunstrand Single-Pad Air Sander

Development of a straight-line action single-pad air sander has been announced by the Pneumatic Division of Sundstrand Machine Tool Co., Rockford, Ill. Small and compact, it is easy to handle and can be worked with equal ease over both flat or curved surfaces.

Due to its straight-line action, the Sundstrand Single-Pad Sander leaves no swirls or pressure marks, the manufacturer states. Also, it operates both wet or dry, making it suitable for use on a wide variety of finishing operations. For the auto body shop, it is able to handle all five body refinishing operations—removing grinder marks, feather-edging, scuffing old paint, wet or dry sanding primer coat, and lacquer color coat sanding.

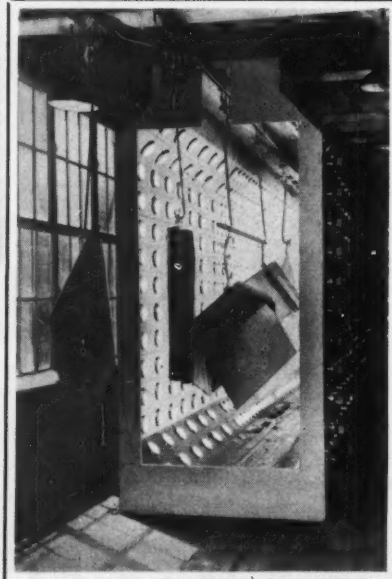


Sundstrand Single-Pad Air Sander

ARP Brighteners

Allied Research Products, Inc., 4004 E. Monument St., Baltimore 5, Md. has expanded its line of ARP Brighteners for use in zinc or cadmiun plating. The series now includes three specially developed materials, all of which are adaptable to any type of electroplating equipment. Among the advantages offered by these brighteners are: excellent throwing power, increased solution efficiency, uniform coverage, and high quality work.

For zinc plating, the ARP line includes two brighteners. APR No. 5 is claimed to be particularly good in low current density ranges and is capable of producing a bright plate with a blue chrome-type cast directly from the plating solution. ARP



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TRIANGLE INFRARED OVENS are designed to meet your requirements.

They can be used for batch loading, with a conveying system, or to supplement your present heating facilities.

Made of standardized, prefabricated parts, TRIANGLE INFRARED OVENS can be altered quickly to meet revised production schedules.

By using radiant heat and derived convected heat, positive controls and ventilation, TRIANGLE INFRARED OVENS give uniform, consistent results, with speed and economy—regardless of atmospheric conditions. Safety, cleanliness, the saving of floor space and reduced maintenance are the "extras" you get with a TRIANGLE INFRARED OVEN, at no additional cost.

Send a sample of your product for a time and temperature test—no cost is involved.
Bulletin will be sent on request.

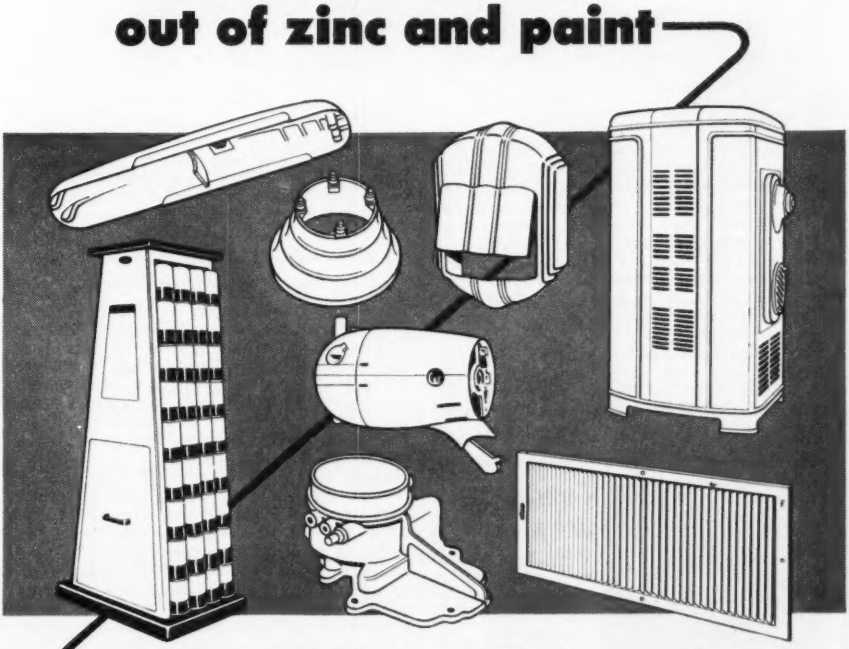
TRIANGLE EQUIPMENT CO., INC.

Designers, Engineers, Manufacturers

45 RIVER ROAD **NUTLEY, N .J.**

BONDERITE

makes fast friends out of zinc and paint



Today, paint finishing zinc coated and zinc diecast parts—once a costly and difficult problem for manufacturers and users—is simple, sure and speedy when Bonderite is used before painting.

On zinc and zinc alloy diecastings Bonderite stabilizes the reactive nature of zinc, uniformly coating all surfaces, deep recesses and orifices. Zinc coated steel sheets, widely used in industry, get the same important benefits from Bonderite treatment.

The Bonderite coating, integral with the metal, is compatible with all types of paint, assuring lasting finish life for component parts or products where fine appearance is important.

If you are now using ineffectual etching or time-consuming weathering methods to prepare your zinc products for paint, investigate Bonderite protection today. Write for full information.

Bonderite, Parco, Parco Lubrite—Reg. U.S. Pat. Off.

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PARKER RUST PROOF COMPANY
2172 East Milwaukee Ave.
Detroit 11, Michigan

BONDERITE—Corrosion Resistant Paint Base • PARCO COMPOUND—Rust Resistant • PARCO LUBRITE—Wear Resistant for Friction Surfaces

No. 3 operates in higher current densities and produces a zinc plate with a bright yellow nickel-type cast.

For cadmium plating, ARP No. 4 operates throughout any current density and produces a silvery bright plate.

Northwest Emulsion Cleaners

A cleaning process for all metals has been worked out in the laboratories of Northwest Chemical Co., 9310 Roselawn, Detroit 4, Mich., utilizing emulsion cleaners of the W/O type, based on petroleum products, to replace hot chlorinated solvent degreasing. In effect, the system is equivalent to spraying the work with solvent, while immersed in water, rather than in the air. Since the emulsions are characteristically unstable, mechanical agitation is required to maintain dispension of the solvent in the water phase. Agitation may be induced by propeller-type mixers or by a pump and jet system.

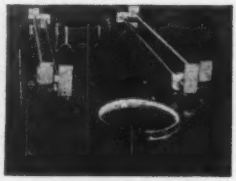
The two-phase bath is built up of petroleum solvent and treated with a small proportion of Northwest Addition Agent No. 230. The two-phase bath can also be prepared by adding directly to the water 10 to 50 per cent Northwest Emulsion Cleaner No. 3. The baths may be heated to a maximum of 160 deg. F., depending upon the solvent used. In some cases, the agitation may be dispensed with but in all cases the two-phase precleaning must be followed by a thorough spray rinse. According to the Northwest Chemical Company, this rinse has a unique cleaning effect in conjunction with a displacement film deposited on the metal in the emulsion precleaner. The film is extremely thin and invisible, but is essential to the complete removal of microscopic particles of foreign matter.

The process is adaptable to the smallest shop or the largest plant, automatic or manual handling. Parts to be plated may be kept on the plating racks throughout the operation.

"Atomite"

An immersion process which provides a deep black rust-resisting finish for carbon steels and steels of low chromium content, called "Atomite", is available from the Atomite Black Co., 547 Washington Blvd., Chicago 6, Ill. A gloss black on smooth surfaces or a non-reflecting dull matt finish on etched or sandblasted surfaces can be obtained.

Used in place of zinc or cadmium on steel, Atomite is claimed not to crack, chip, or peel. Features of the process as outlined by the manufacturer are: Atomite eliminates dimensional changes; reduces friction on moving parts; requires no baking or drying time; will not affect heat treated parts; is oil absorptive, aids lubrication, requires no expensive equipment; remains deep black at 1000 deg. F.; is an excellent base for lacquers, and so on; reduces arcing and flashing when welded; requires less coloring time; and can be produced in a single bath.



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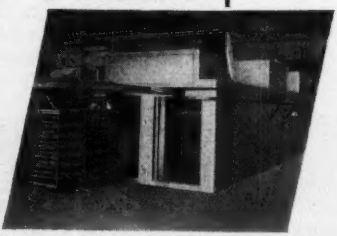
Designed and built to produce the finest results in baking processes such as PAINT FINISHING, METAL DECORATING, INSULATION BAKING. Batch or Conveyor Types for any fuel. Write for Bulletin 3.



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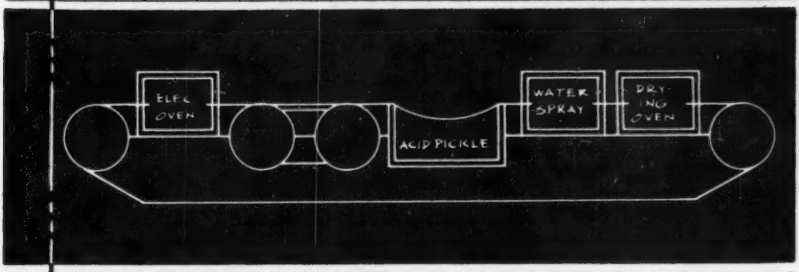
NO MANPOWER PROBLEMS HERE



4-STATION WIRE BELT CUTS HANDLING COSTS IN HALF, BOOSTS OUTPUT 25 TIMES! In this specially designed installation, one woven wire conveyor belt carries metal dial faces through the four steps shown, in a continuous straight-line operation prior to porcelain enameling. Stainless steel used in constructing the belt will not form heat scale, resists corrosion from both the acid bath and the water rinse. Open mesh of the wire belt allows free heat circulation at end stations, free drainage of pickling solution and rinse water. Retaining cleats attached to the belt hold the dials in a vertical position, thus allowing maximum utilization of the belt surface.

The results? 2 Operators can now produce over 100,000 parts in the time 4 operators formerly required to produce only 4000 parts!

Perhaps you could speed production by combining product movement with processing on a woven wire belt. Why not call in your Cambridge field engineer today and let him explain all the advantages of . . .

Cambridge Woven Wire Conveyor Belts

Write direct or call your nearest Cambridge office. See "Belting, Mechanical" in your classified telephone directory.

FREE CONVEYOR BELT MANUAL gives woven wire belt design, specifications and construction. Also contains valuable installation diagrams and metallurgical data. Write for your copy of this valuable reference.

The Cambridge Wire Cloth Co.

WIRE CLOTH | METAL CONVEYOR BELTS | SPECIAL METAL FABRICATIONS

Department A
Cambridge 3,
Maryland

OFFICES IN PRINCIPAL INDUSTRIAL CITIES

White Baking Enamel No. 8878

The Industrial Finishes Division of the Central Paint & Varnish Works, Inc., 30 Prospect St., Brooklyn 1, N. Y., has developed a synthetic baking enamel which is claimed to greatly reduce the nuisance and damaging properties of overspray exhausted from dry spray booths.

White Baking Enamel No. 8878 has been formulated to produce a non-adherent spray dust when atomized and exhausted. The spray dust does not adhere to finished surfaces, but instead resembles the appearance of atmospheric dust which can easily be wiped off or is carried away by the air.

High solids combined with outstanding hiding and fast curing properties are advantages claimed for the enamel base.

Bright Zinc Plate Finishes

Two compounds, Iridite No. 8P and Iridite No. 12, have been added to its line of chromate finishes for bright finishing of zinc plated surfaces by Allied Research Products, Inc., 4004 E. Monument St., Baltimore 5, Maryland.

Iridite No. 8P is sold in powder form, which provides the advantages of low freight rates, easy handling, and elimination of use of carboys and their return.

Iridite No. 12 is a chromate for bright zinc plate that both passivates and imparts a chrome-like appearance to the plated surface. Shipped in carboys in concentrated form, the compound is diluted with 30 parts of water to make a working solution. Unlike other Iridite bright-type finishes, Iridite No. 12 provides relatively little chemical polishing action for the zinc, and thus should be applied only to bright zinc deposits.

Like all Iridites, both products are applied by a simple chemical dip method using standard finishing shop equipment.

Looking for a Better Finish?

Try

HARRISON'S

4A

TAILOR-MADE BUFFING & POLISHING COMPOUNDS

for

Aluminum, Brass, Copper, Stainless Steel, Carbon Steel, Etc.

EMERY CAKE, GREASE STICK

CEMENT AND THINNER
for setting up wheels, belts, and rolls

HARRISON & COMPANY, INC.
Haverhill, Massachusetts

PRODUCT LITERATURE

The publications listed in this section may be obtained free upon written request on company letterhead to the manufacturers concerned. Your courtesy in mentioning PRODUCTS FINISHING when requesting copies of these publications will be sincerely appreciated by the manufacturer and the publisher of this magazine.

Rust-preev. Information on this process to preserve ferrous metals from rusting during fabrication and interim storage periods can be obtained from the Neilson Chemical Co., 6561 Benson St., Detroit 7, Michigan.

Pur-Blac Process for Blackening Steel. The Purico Pur-Blac Process for coloring steel is the subject of a four-page data sheet available from The Puritan Mfg. Co., 29 Benedict St., Waterbury 65, Conn. Complete instructions for operation of the process are provided.

CORROSION-PROOF PROCESSING TANKS

- Corrosion-proof construction of processing and storage tanks; industrial flooring.
- Experience serving major steel, chemical, textile and food plants.
- Complete Facilities: Design; Engineering; Material; Construction; Maintenance.

Write for bulletin giving complete details

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301 Chemsteel Building, Walnut Street, Pittsburgh 32, Pa.

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TRADE MARK
PALLADIUM PLATING SOLUTION
With the current restrictions in nickel, perhaps palladium will answer your needs.
"PALLITE,"* the original palladium plating solution, has given satisfactory results in plating wave-guides and other electronic equipment, where throwing power and ease of operation are most important.
*PALLITE is the trade name for the patented Palladium solution, proven successful during the difficult years of shortages of nickel and other critical metals.
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PRECIMET LABORATORIES
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Grinding Wheels. Facts about Bay State "Koolpore" Grinding Wheels are set forth in an illustrated four-page brochure obtainable from the Bay State Abrasive Products Co., Westboro, Massachusetts.

McKeon's "Zinc-Brite," a concentrated toner and conditioner for the precipitation of heavy metal impurities and the removal of carbonates from zinc plating solutions, is discussed in a six-page leaflet distributed by Sulphur Products Co., Inc., Greensburg, Pa. Directions for use and prices are included.

"Who Uses Hot-Spray Lacquer . . . and Why?", a 12-page two-color brochure prepared by the Hercules Powder Co., Wilmington 99, Del., is a summary of a survey on the use of hot-spray lacquer. The reasons for the outstanding growth in the use of hot lacquer are included, together with other pertinent information about the survey.

Bulletin 949, issued by the Morse Manufacturing Co., Inc., 125 Dickerson St., Syracuse 2, N. Y., describes and illustrates the Morse Rock-A-Drum Vertical Truck, with which one man can easily and safely position heavy drum loads of paints, lacquers, chemicals, emulsions, and all types of liquids and semi-liquids.

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11 Empire Street, Newark 8, New Jersey

Unichrome Clear Finishes. United Chromium, Inc., 100 E. 42nd St., New York 17, N. Y., has available a data sheet describing the following clear, air-drying and baking finishes: Unichrome Lacquer A-100-X, Lacquer A-112, Lacquer A-140, Baking Synthetic B-115, Baking Synthetic B-132, and Baking Synthetic B-138.

"A Guide to the Engineering and Design of Finish Baking Ovens" is the title of an eight-page reprint available from the Ferro Enamel Corp., 4150 E. 56th St., Cleveland 5, Ohio. An approach to baking problems is presented, the factors involved are discussed, and a procedure for converting this data into a complete baking installation is offered.

Cincinnati Metal Cleaning and Finishing Machinery. Cincinnati Cleaning and Finishing Machinery Co., 311-25 Hecla St., Ironton, Ohio, has prepared a 24-page catalog containing the following information: principles of metal cleaning; conveyor, monorail, drum, turntable, and strip type cleaning machines; phosphatizing machines; cabinet type cleaning machines; agitating type cleaning machines; paint spray booths; special equipment; drying ovens; and accessories. Many illustrations are included.

Pre-Tested Dust Collectors for Various Types of Industrial Dusts. A 38-page catalog containing illustrations and specifications of the complete line of "Dustkop" Dust Collectors available in standard, pre-tested units has been issued by the Aget-Detroit Co., Ann Arbor, Mich. Illustrations are included of almost every typical dry grinding dust control problem, and considerable space is also devoted to buffing and polishing dusts, as well as to the control of chips and shavings from metal working machines.

The catalog also deals with control of vapor and mist from various wet grinding and machining operations. In addition, accessories for installing Dustkops are illustrated and priced.

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"How to Choose the Behr-Manning Belt for Your Job" is the title of **B-M Bulletin, Volume 9, No. 4,** released by Behr- Manning, Troy, N. Y. This four-page bulletin provides pertinent data on glue type and resin type Metalite abrasive belts.

SpeedWay No. 150 SpeedSander, which sands and polishes almost any surface quickly and easily, is illustrated and described in **Bulletin No. 150-100,** available from the SpeedWay Manufacturing Co., 1834 S. 52nd St., Cicero 50, Illinois.

"Houghto-Black," a fast and easy process of blackening steel parts, is discussed in detail in a four-page illustrated leaflet obtainable from E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa. Methods of application and features of the product are outlined.

Industrial Washing and Drying Machines. A 12-page catalog describing and illustrating its complete line of equipment for washing, cleaning, rinsing, slushing, dipping, Bonderizing, or drying products can be obtained from the Industrial Washing Machine Corp., Dept. 10, New Brunswick 2, New Jersey.

Testing Instruments for the Paint and Other Industries. For quick and ready reference, descriptions of the 75 items made or sold by Henry A. Gardner Laboratory, Inc., 4723 Elm St., Bethesda 14, Md., are presented in abstract form in a 32-page catalog. In most instances illustrations are included.

Bulletin 1150 describes and illustrates the Logan Aridifier, product of the Logan Engineering Co., 4901 W. Lawrence Ave., Chicago 30, Ill., which cleans and dries compressed air, and removes 92 per cent of oil, water, and dirt from gas and air lines.

Advanced Barrel Finishing, what it is, how it works, and who can use it are all explained in a 22-page booklet. Prepared by Almco, Division of Queen Stove Works, Inc., Albert Lea, Minn., **Booklet No. A-1** is well illustrated and contains much pertinent information on the use of Almco Supersheen Processes for advanced barrel finishing.

Protection for Aluminum. American Chemical Paint Co., Ambler, Pa., has made available a 24-page article entitled **"Amorphous Phosphate Coating for Protection of Aluminum Alloys and for Paint Adhesion,"** which was originally presented at a national convention of the American Electroplaters' Society by Alfred Douty and F. P. Spruance, Jr.

Bulletin ET 145, featuring the Ernst Portable, Direct Reading Metal Hardness Tester, has been issued by Newage International, Inc., 521 Fifth Ave., New York 17, N. Y. Described is the distinctive design of the product, where by just pressing the handgrips on the sides of the instrument, immediate direct "at-the-job" readings of all types of metals are obtained. The bulletin includes pertinent illustrations together with detailed principles of operation, advantages, and applications.

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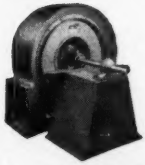

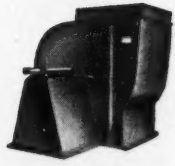

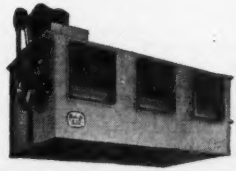

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For further information on any product mentioned in this issue—use the READER SERVICE CARDS between the covers.

Black Oxide for Steel. Available upon request on company letterhead from Empire Solvents, Inc., 153 E. 26th St., New York 10, N. Y., is a booklet describing the Empire Black process for producing a black oxide finish for steel and iron. Methods of application and advantages of the finish are included.

Osborn Industrial Brushes. The Osborn Manufacturing Co., Dept. 392, 5401 Hamilton Ave., Cleveland 14, Ohio, has available **Catalog No. 210** which describes and illustrates its complete line of wire or bristle brushes. A detailed alphabetical and numercial index aids in the selection of the correct brush, whether a hand brush or a fine, precision-built power-driven tool.

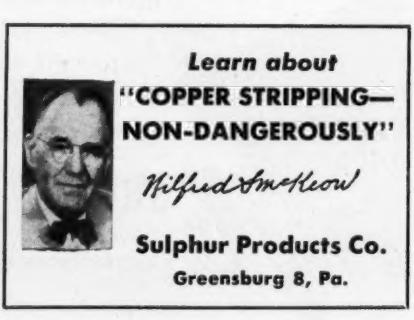
Buffing and Polishing Compositions" is the title of a 20-page catalog available from Lasalco, Inc., 2818-38 LaSalle St., St. Louis 4, Mo., by requesting on company letterhead. Containing much information on buffing and polishing metals and plastics, the catalog is replete with charts showing compositions to use on all types of materials from aluminum to zinc, composition tests, characteristics of various kinds and grades of compositions, and other useful data.

ALUMINIZED Steel, steel with a special coating of aluminum, is discussed in a booklet published by Armco Steel Corp., Middletown, Ohio. The illustrated 24-page booklet, **"Armco ALUMINIZED Steel",** describes the steel's aluminum surface, its heat and corrosion resistance, and outstanding heat reflectivity. Photographs and a listing of applications show where manufacturers have used ALUMINIZED in a wide variety of products.

Also included are data on mechanical and forming properties, available sizes and gauges, as well as detailed recommendations for welding by various methods, brazing, and finishing.

Electrolytic Cleaning. The DuBois Co., Industrial Div., Cincinnati 3, Ohio, has published a revised and enlarged edition of its electrolytic cleaning booklet, **"An Introduction to Electrolytic Cleaning."** The revised edition contains information on the fundamentals of electrolytic cleaning, the phenomena that take place during electrolytic cleaning, the differences between the various electrolytic cleaning processes, the attributes of a good electrocleaner, and considerations in the choice of an electrocleaner for any particular process.

New in this enlarged edition are data on the cleaning of die-cast metals, the cleaning of cuprous metals including reverse current cleaning without discoloration, soak tank cleaning, and paint stripping. Typical cleaning cycles and also several case histories of actual plant operations with ALKON, DuBois electrocleaner, are presented.



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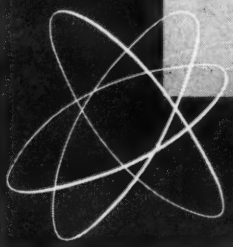

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721 Phillips Ave. **Toledo 12, Ohio**

Prep-Pik-L, a heavy rust and light scale remover which is non-corrosive on surrounding equipment, is the subject of **Prep-Pik-L Bulletin 49-3,** released by the Neilson Chemical Co., 6561 Benson St., Detroit 7, Michigan.

"Colors for Paint, Lacquer and Enamel," published by the Pigment Dept., American Cyanamid Co., Calco Chemical Div., Bound Brook, N. J., lists selected Calco colored and white pigments and dyes considered to be of greatest use in the formulation and manufacture of paints, lacquers, enamels, and related products. The catalog also features complete data describing the most important characteristics of each listed product, based on laboratory tests and application experience.

Filter Pump Units. Sethco, 105-07 150th St., Jamaica 4, N. Y., is offering a six-page brochure on its line of small, stainless steel Filter Pump Units. The brochure is fully illustrated and includes technical as well as descriptive data and prices.

Water Conditioning Equipment. Illinois Water Treatment Co., 899 Cedar St., Rockford, Ill., has issued an eight-page folder describing ionXchange water conditioning equipment, including softeners, hydrogen zeolite, de-ionizers, and the Illco-Way Mixed-Bed De-Ionizer. Specifications are included in **Bulletin A** on the Illco-Way "package-type" units available for flow rates up to 1,000 gallons per hour.

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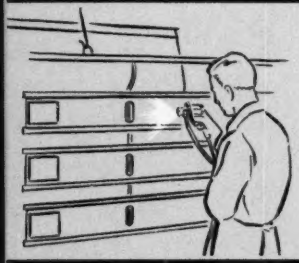

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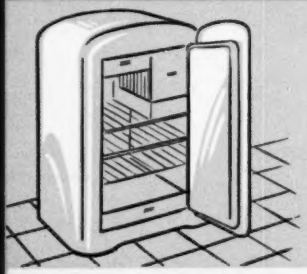

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